Lee W. Lenz

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Contributions by
CARL B. WOLF, *Garden Botanist*

RANCHO SANTA ANA BOTANIC GARDEN
of the
NATIVE PLANTS OF CALIFORNIA
Santa Ana Cañon, Orange County, California
Established 1927 in Memory of
JOHN W. BIXBY

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RANCHO SANTA ANA BOTANIC GARDEN
of the
NATIVE PLANTS OF CALIFORNIA

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INTRODUCTION TO BOTANICAL CONTRIBUTIONS

Since the establishment of Rancho Santa Ana Botanic Garden in 1927, members of the Garden Staff have been afforded opportunities and facilities for field, herbarium and cultural studies upon a large number of Californian plants. Some of these investigations are now sufficiently complete to be presented at this time in the following articles.

Thanks are tendered to Miss Alice Eastwood, Dr. L. R. Abrams and Dr. P. A. Munz, Garden Councillors, for reading the manuscript and for offering valuable suggestions.

Those in charge of the following herbaria are thanked for permitting frequent consultation of their general collections and also for loans of selected materials: Dudley Herbarium, California Academy of Sciences, University of California, Pomona College, University of California at Los Angeles and the San Diego Museum of Natural History.

Abbreviations used to designate the herbaria in which specimens cited in these studies are deposited or to which specimens have recently been distributed are as follows:

RSA,—Rancho Santa Ana Botanic Garden Herbarium.
DS,—Dudley Herbarium of Stanford University.
CA,—California Academy of Sciences.
P,—Pomona College.
UC,—University of California.
AA,—Arnold Arboretum.
M,—University of Montana.
UCLA,—University of California at Los Angeles.
US,—United States National Herbarium.
Gr,—Gray Herbarium.
NY,—New York Botanical Garden Herbarium.
SD,—San Diego Museum of Natural History.
CI,—Carnegie Institution of Washington, Palo Alto.

Regular collections by the Garden Staff are maintained under one series of numbers, each designated as an Herbarium Number. In the present papers the following procedure has been used in citing such collections: when such collections have been made solely by C. B. Wolf they have been indicated only by the Herb. No.; otherwise the collector's name or collectors' names are given in addition to the Herb. No. Specimens formerly part of the private herbarium of C. B. Wolf (now part of Rancho Santa Ana Botanic Garden Herbarium) are merely indicated by name and the collection number.

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THE PLAYA DEL REY SALTBUSH

Atriplex johnstoni C. B. Wolf, new species.

Planta fruticosa, erecta, 2-3 meters alta, 2-4 meters lata, monoecia vel semidioecia; foliis alternis, spathulatis-orbiculatis, 2.5-6.5 cm. longis, 1.5-6.5 cm. latis, serratis, dentatis vel integris, trinervatis; petiolis 5-12 mm. longis; fructibus orbiculatis, 5-12 mm. longis et latis, spongiosis; seminibus 2 mm. latis; radiculis curvatis, superioribus.

Erect shrubs, 6-12 ft. (2-3 meters) high, 6-15 ft. (2-4 meters) spread, main trunks 2-4 in. (5-10 cm.) in diameter, bark dark brown. Young plants, or those predominantly staminate, stiffly erect and higher than broad; plants predominantly pistillate with branches somewhat spreading and bent down by the weight of the heavy fruits. Small branches with light gray bark; branchlets greenish, striated. Leaves evergreen, abundant, blue-green; cotyledons in seedling plants linear, about ⅜ in. (1 cm.) long; first 2 or 3 pairs of leaves opposite, the later alternate; petioles 3/16-½ in. (5-12 mm.) long; blades thick (much more so at the coast than under cultivated conditions at the Garden), much alike on both surfaces, 1-2½ in. (2.5-6.5 cm.) long, ½-2½ in. (1.5-6.5 cm.) wide, slightly undulate, low-serrate to dentate or many leaves nearly entire, apex rounded or obtuse, sometimes retuse, often minutely cuspidate, base cuneate or truncate; older leaves with 3 conspicuous veins arising at base of blade. Plants semi-dioecious, that is predominantly staminate or pistillate, but apparently never strictly so. Staminate inflorescence crowded at the ends of the branches and consisting of numerous short spikes forming a large panicle, mostly leafy-bracteate; staminate flowers 5-merous, occasionally 4-merous, densely scurfy. Pistillate inflorescence densely aggregated into compound panicles 6-10 in. (1.5-2.5 dm.) long, the leafy bracts early deciduous or lacking toward the ends of the branches; perianth lacking; fruiting bracts sessile, thick and corky, slightly convex and light tan or straw-colored when dry, united for one-half their length, the free margins closely appressed or slightly spreading at maturity, broadly orbicular, ¼-½ in. (5-12 mm.) long, truncate at base, pointed or rounded at apex, margins with 4-6 coarse teeth or nearly entire. Seeds brown; radicle curved, superior. Flowering mainly in the early spring and producing mature fruits in June and July, these remaining on the plants for several months, during which time the margins and surfaces of the bracts weather away to a considerable degree, thus giving the fruiting clusters a peculiar appearance.

FIGURE 1. Type specimen of **Atriplex johnstoni** C. B. Wolf. Herbarium No. 1821, December 23, 1930, deposited in Rancho Santa Ana Botanic Garden Herbarium, Sheet No. 2811.

HABITAT. Upper Sonoran Zone, coastal bluffs, 25-100 ft. (8-30 meters) elevation, sandy soil, in association with *Franseria bipinnatifida, Abronia umbellata* and *Lupinus chamissonis*.

RANGE. Known only from the type locality, where about 100 plants grow scattered over an area of less than one-quarter of a mile in extent (FIG. 2).

FIGURE 2. Coastal bluffs at Playa del Rey showing part of the colony of the Playa del Rey Saltbush. The most extensive clump shown at the top of the bluff slightly to the left of the center of the picture. Photo June 9, 1934.

TYPE LOCALITY. Sandy soil of coastal bluffs, 25-100 ft. (8-30 meters) elevation, Upper Sonoran Zone, Playa del Rey, Los Angeles County, California. TYPE SPECIMEN: *C. B. Wolf,* Herb. No. 1821, December 23, 1930, deposited in Rancho Santa Ana Botanic Garden Herbarium, Sheet No. 2811 (FIG. 1). Isotypes sent to DS, CA, P, UC, AA, M, UCLA, US.

SPECIMENS EXAMINED. The following were all obtained from wild plants at the type locality: *I. M. Johnston* 1900, June 10, 1917 (DS, P, UC, RSA—a photograph of the UC specimen); *S. B. Parish* 11871, June 5, 1918 (UC, RSA—a photograph of the UC specimen); *P. A. Munz* 12817 & 12818, Aug. 31, 1932 (P); *L. C. Wheeler* 1657, April 27, 1933 (RSA); Herb. No. 1821, Dec. 23, 1930 (type collection, RSA, DS, CA, P, UC, AA, M, UCLA, US); Herb. No. 1822, Dec. 23, 1930 (RSA, DS, CA, P, UC, AA, UCLA); (Herb. Nos. 2632—2638 all taken on Dec. 30 1931) Herb. No. 2632 (RSA, DS, CA); Herb. No. 2633 (RSA, DS, CA); Herb. No. 2634 (RSA, DS, CA); Herb. No. 2635 (RSA, DS, CA, P, UC, AA, M); Herb. No. 2636 (RSA, DS, CA, P); Herb. No. 2637 (RSA, DS, CA); Herb. No. 2638 (RSA, DS, CA, P); Herb. No. 5740, June 9, 1934, these were taken from the type plant (RSA, DS, CA, P, UC, AA, M, UCLA, US, Gr, NY).

The following are all specimens of seedlings collected at Rancho Santa Ana Botanic Garden: April 30, 1931, grown from Prop. No. 1082 (RSA); (Herb. Nos. 4185-4189 all taken on Aug. 19, 1932) Herb. No. 4185, from test

seeds of Herb. No. 2636 (RSA, DS, CA, P, UC, AA, M, UCLA, US, Gr, NY); Herb. No. 4186, from test seeds of Herb. No. 2632 (RSA, DS); Herb. No. 4187, from test seeds of Herb. No. 2635 (RSA, DS, CA); Herb. No. 4188, from test seeds of Herb. No. 2637 (RSA, DS, CA, P, UC, AA); Herb. No. 4189, from test seeds of Herb. No. 2633 (RSA, DS, CA, P, UC).

The Playa del Rey Saltbush was pointed out by Hall and Clements in Carn. Inst. Wash. Publ. 326:336. 1923, as "minor variation 4" of *Atriplex lentiformis breweri* (Wats.) Hall and Clements, as follows: "A form with spatulate-orbicular entire to dentate leaves 1.5 to 3 cm. broad and bracts 9 to 10 mm. broad has been collected on the seacoast bluffs at Playa del Rey, Los Angeles County, California (*Parish* 11871, UC). With only an occasional exception, the ovaries fail to develop and the whole appearance of the plant is that of a monstrosity. There is no evidence of injury due to insects. Staminate plants from the same locality (*Johnston* 1900, UC) have similarly broad suborbicular leaves, some of which are truncate at base, the remainder tapering to the petiole. The leaf shape is approached in specimens of subspecies *typica* from the Colorado River bottoms near Needles (March 3, 1910, *Grinnell*, UC). According to Johnston, there is a considerable area at Playa del Rey where the peculiar form grows to the exclusion of normal *breweri*. The latter, however, grows along near-by lagoons."

This constitutes the only published information regarding this plant. In fact, the collections of Johnston and Parish seem to have been the only ones made until after the plant was brought to attention by the present studies.

The specific name for the Playa del Rey Saltbush is given in honor of Dr. Ivan M. Johnston of the Arnold Arboretum, who was the first to collect it, and who has since been most helpful in the present studies by consulting material of *Atriplex* in the eastern herbaria.

Field Studies

Our first visit to the Playa del Rey area where this species grows was made on December 23, 1930. At that time the approximate area covered by the bushes was gone over and a large fruiting plant selected for obtaining herbarium specimens (Herb. No. 1821). Seeds from this same bush were gathered (Prop. No. 1082), and a few small plants from its base were dug (Prop. No. 1081).

The plants at Playa del Rey were next observed on June 25, 1931, but no specimens were collected. The spring flowering and early summer fruiting were noted at that time in contrast to the fall flowering and fruiting of *breweri*. On that date the coastal area from Playa del Rey to El Segundo was thoroughly searched for other stands of *johnstoni*, but none was found.

On December 30, 1931 the area at Playa del Rey was again visited and a series of herbarium collections made (Herb. Nos. 2632 to 2638). With all but 2634 and 2638 small amounts of seeds were collected to make tests for normal germinations.

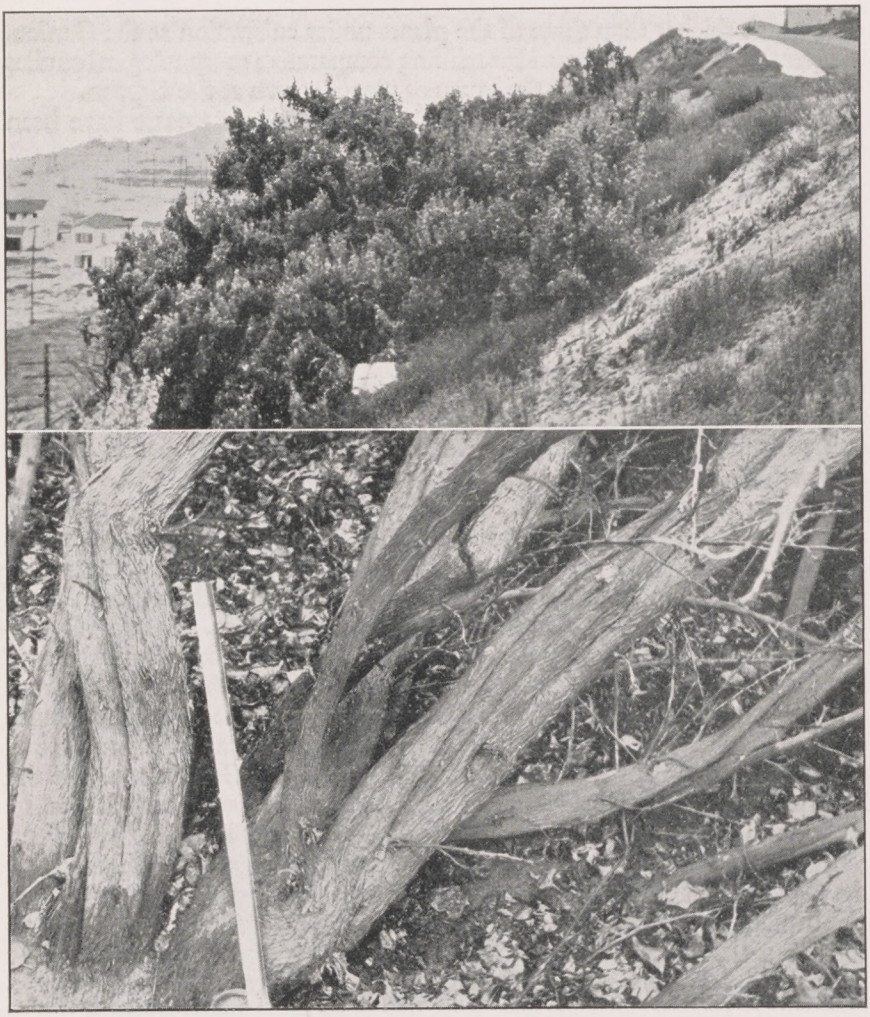

FIGURE 3. **UPPER.** Type plant of **Atriplex Johnstoni.** Height 8 ft., spread 13 ft. Photo June 9, 1934. **LOWER.** Trunk of same with 1 ft. rule at base. Collections from this plant include Herb. Nos. 1821 & 5740.

On June 9, 1934 a large set of specimens (Herb. No. 5740) was collected from the type plant. The exact location of the plant is on the bluff about 30 ft. (10 meters) west of Vista del Mar St. and on a line 8 ft. (2.5 meters) south of the north curbing of Freeman St. On this visit the plant was heavily laden with mature and maturing fruits. The plant measured 8 ft. (2.5 meters) in height and 13 ft. (4 meters) in spread and had a main trunk of over 4 in. (1 dm.) in diameter (Fig. 3). It was noted that the leaves of the plant

were much thicker than those of the plants under cultivation at the Garden, so several leaves were collected for making comparative morphological studies of their structure and that of the leaves of plants grown at the Garden.

Numerous other trips along the Southern California coast have been made, but no other stands of *johnstoni* have yet been found.

Morphological Studies

Cross sections of fresh leaves of *Atriplex johnstoni, breweri, lentiformis, torreyi and hymenelytra* were made from plants cultivated in the Garden in June of 1934. The material for sectioning was taken from approximately the same relative position on each leaf as well as selecting what would be considered mature leaves. Camera lucida drawings of the sections of the leaves of these five species were made (Fig. 4). On the basis of these sections the leaf structure of *Atriplex johnstoni* was found to be most like that of *Atriplex hymenelytra.*

Epidermal layers from the leaves of these same five species were mounted and drawings made showing the epidermal surface, except in the case of *Atriplex hymenlytra* in which the surface was so scurfy that the stomata were completely hidden (Fig. 5). The epidermal cells and the stomata were much larger in *Atriplex johnstoni* than in the other species.

Cross sections of fresh leaves of *Atriplex johnstoni* taken from the type plant at Playa del Rey were made on June 9, 1934 (Fig. 4, B). These were much thicker than similar sections of *johnstoni* leaves made from plants under cultivation at the Garden (Fig. 4, A). The main difference in the structure of the leaves of the plant from the coast and those at the Garden was that the large water storage cells adjacent to each leaf surface were much larger. In addition to this increase in size of individual cells extra layers had also been formed. These differences in leaf structure seem to represent the effects of the two different environments under which the plants grew.

Studies of the fruits of *Atriplex johnstoni, breweri, lentiformis, torreyi* and *hymenelytra* were made from dry and fresh materials (Fig. 6). The fruits of *A. johnstoni* were by far the largest as well as the most corky. In these two characters the fruits were most like those of *A. hymenelytra.* A rather surprising feature of the study of the fruits of these species was the fact that the seeds of *A. johnstoni* were but very little larger than those of *A. breweri,* despite the great difference in size of the fruits of the two species.

In size and shape of leaves *A. johnstoni* differs very markedly from *A. breweri, lentiformis, torreyi* and *hymenelytra* (Fig. 7, Lower).

Cultural Studies

Only a very brief summary of the propagation of this species is given below. Additional data covering propagation steps and performance are recorded in the permanent records maintained at the Garden.

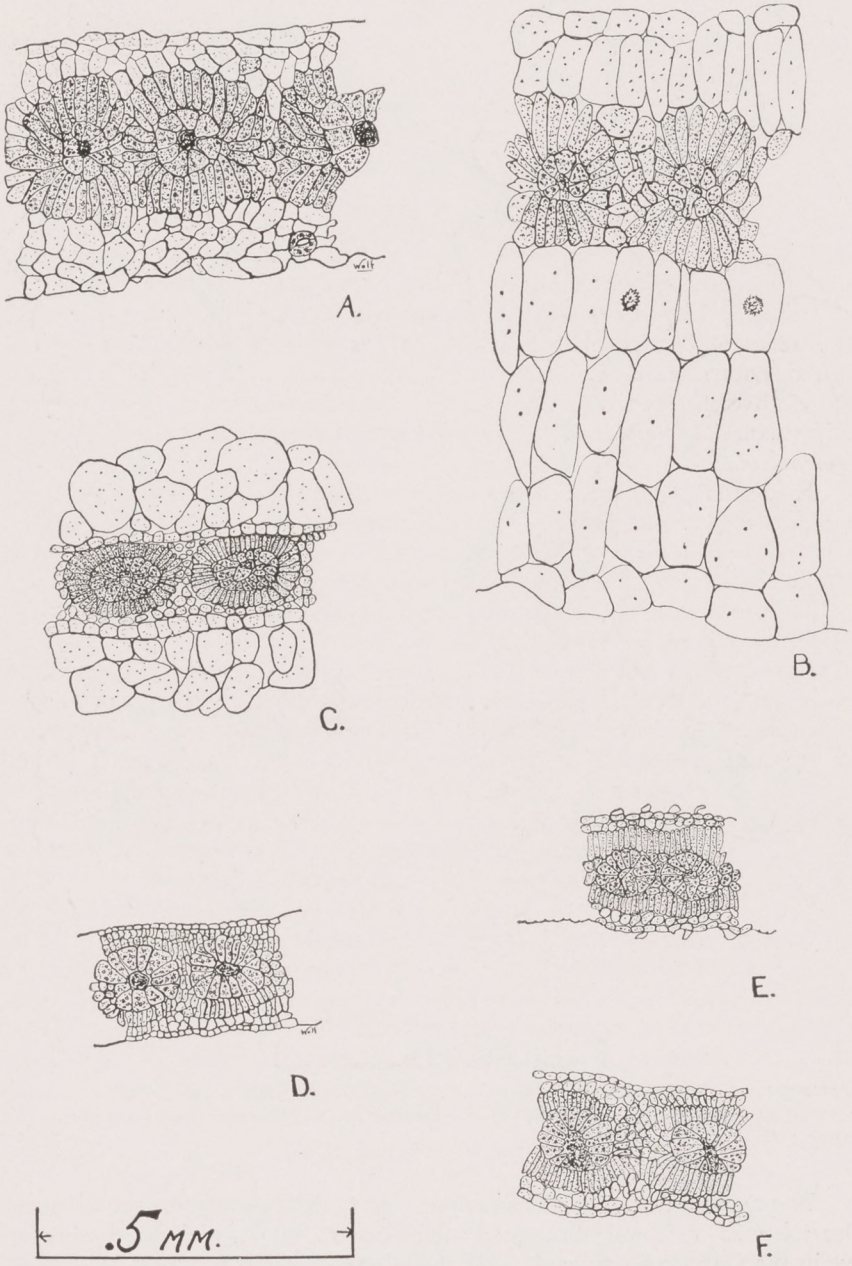

FIGURE 4. Cross sections of **Atriplex** leaves made from fresh materials in June of 1934. A & B, **johnstoni**. C, **hymenelytra**. D. **breweri**. E. **lentiformis**. F. **torreyi**. B, from Playa del Rey; others cultivated. Note differences in **johnstoni**, A & B.

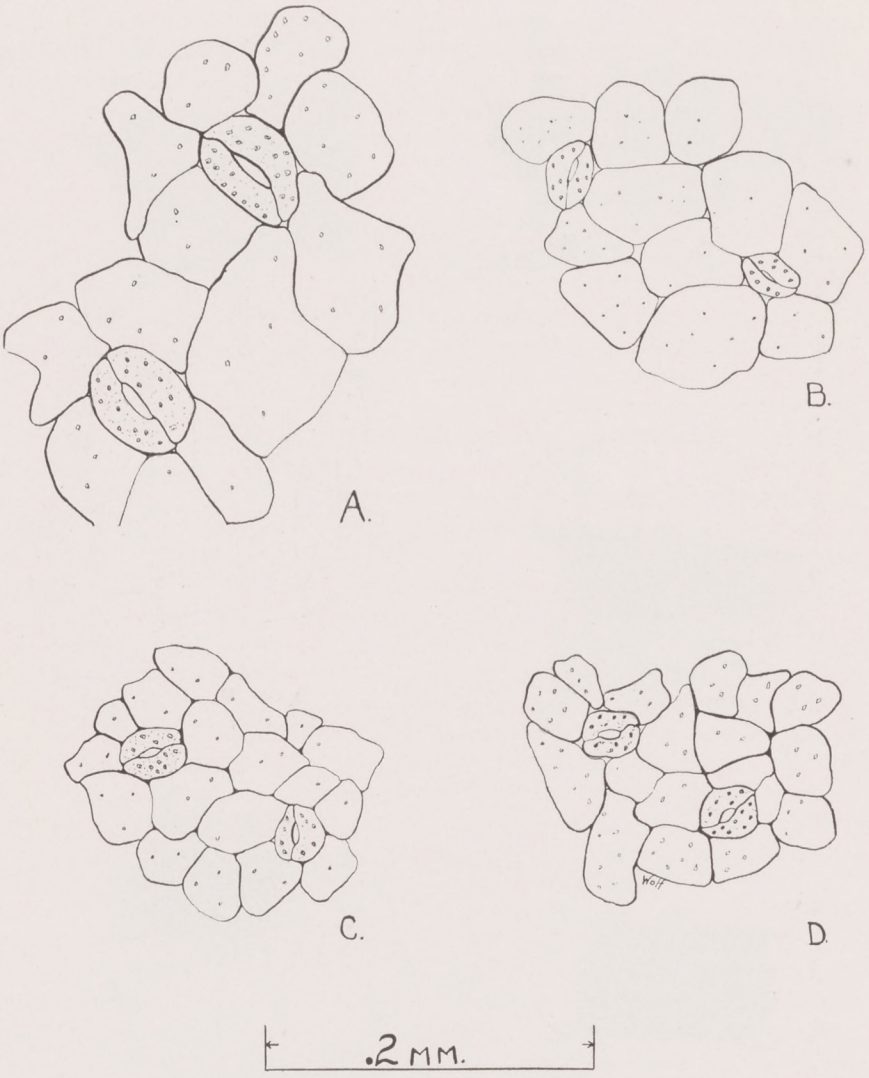

FIGURE 5. Lower epidermal surfaces of Atriplex leaves made from fresh cultivated material in June of 1934. A, **johnstoni**. B, **lentiformis**. C, **torreyi**. D, **breweri**. Note the larger cells in **johnstoni**.

Propagation No. 1081. Small plants dug at the base of the type plant on December 23, 1930 were brought to the Garden. Two which lived were set out in the Garden on June 10, 1931. These have grown to plants of 7 ft. (2 meters) in height. In June, 1934 they were well laden with ripe and maturing fruits.

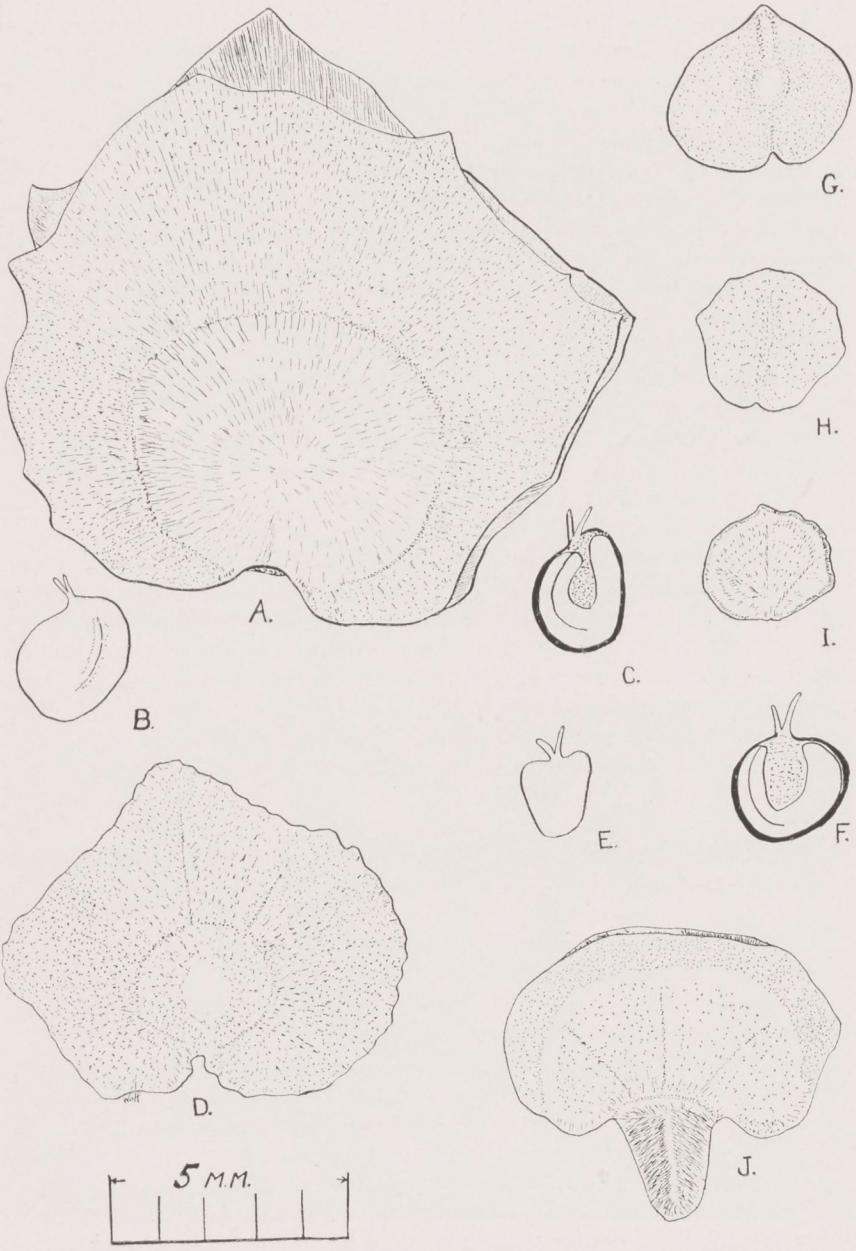

FIGURE 6. Fruits and seeds of **Atriplex.** A, B & C from fresh material; others from the Garden's seed collections. A-F, **johnstoni.** A, fruit. B, seed. C, seed showing embryo. D, dry fruit. E, dry seed. F, seed showing embryo. G, dry fruit of **breweri.** H, dry fruit of **lentiformis.** I, dry fruit of **torreyi.** J, dry fruit of **hymenelytra.**

Propagation No. 1082. The seeds of this collection were all obtained from the type plant on December 23, 1930. They were planted in an outside seed bed in sand on December 26, 1930. The young seedlings were abundant, indictating a normal germination (based on comparison with seedlings of A. *breweri* and *torreyi* being grown at the same time). In leaf shape and color the seedlings of *johnstoni* were easily distinguished from those of the above two species. Seedlings of *johnstoni* were pressed on April 30, 1931, and even after being dried and mounted were easily distinguished from pressed seedlings of *breweri* (Fig. 8 & 9). The plants of *johnstoni* were grown to 6 inch pot size and on November 12, 1931 a planting of 42 was made in the Garden adjacent to the bed of *A. breweri* (Fig. 7, Upper). In June of 1934 many of these plants were well laden with ripe and maturing fruits (Fig. 10). In many instances the weight of the fruit was bending the otherwise erect branches, but in no way was the spreading habit comparable to that found in *breweri* and *lentiformis*. It should also be noted here that at the time of the ripening of fruits of *johnstoni*, that *breweri, lentiformis* and *torreyi* were not yet beginning to flower. *A. hymenelytra* was in flower at the same time as *johnstoni*, but the species has not thrived at the Garden and has set little if any fruit.

Germination Tests. Five lots of seeds gathered in connection with Herb. Nos. 2632, 2633, 2635, 2636 and 2637 were planted in outside seed beds in sand in January of 1932 to determine if germination would be normal for a number of lots of seeds taken at random from wild plants. Germination and growth were normal for all five lots of seeds. By June of 1934 the plants (still in the test plots) had grown to heights of over 6 ft. (2 meters) and many of them were loaded with fruits. The uniformity of the seedlings may be seen by examination of material of each that was collected on August 19, 1932 (Herb. Nos. 4185, 4186, 4187, 4188, 4189).

The present studies began in 1930 when I first visited the Playa del Rey bluffs and found the colony of the Playa del Rey Saltbush. They seemed so different from any saltbushes that I had seen before, that I thought they must be a distinct species—probably an horticultural introduction that had established itself in the limited area.

In January of 1931 I sent Dr. H. M. Hall a few fragments of the Playa del Rey Saltbush and suggested to him that the species might be an horticultural introduction, since seedlings in our nursery were already growing normally. He replied that the plant was "certainly not *breweri*" and proposed to investigate its possibility of being an introduced species. Dr. Hall's subsequent illness and death prevented him from looking further into the subject.

In October of 1931 specimens were sent (Herb. Nos. 1821 and 1822) to Dr. Ivan M. Johnston and he was asked if he would check up on the possibility that the Playa del Rey Saltbush might be an already described species. He very generously searched through the eastern herbaria, but was unable to find any species of *Atriplex* to which our plant might be referred. He suggested that our cultural studies be continued to remove the enigma of "mon-

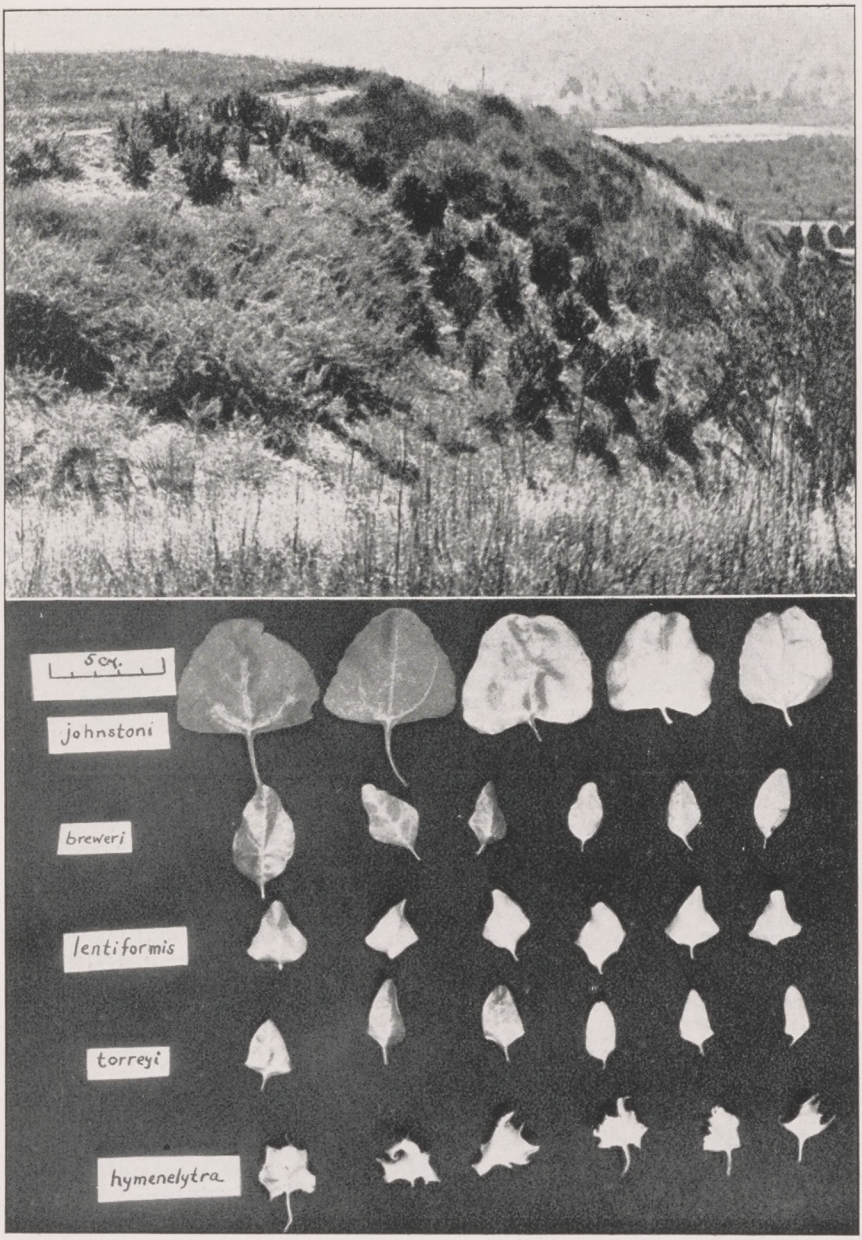

FIGURE 7. UPPER. Plantings of A. johnstoni & breweri in the Garden. A. breweri in left center and light in color. A. johnstoni on slope to right and dark in color. LOWER. Fresh leaves of Atriplex from cultivated plants. Photos June, 1934.

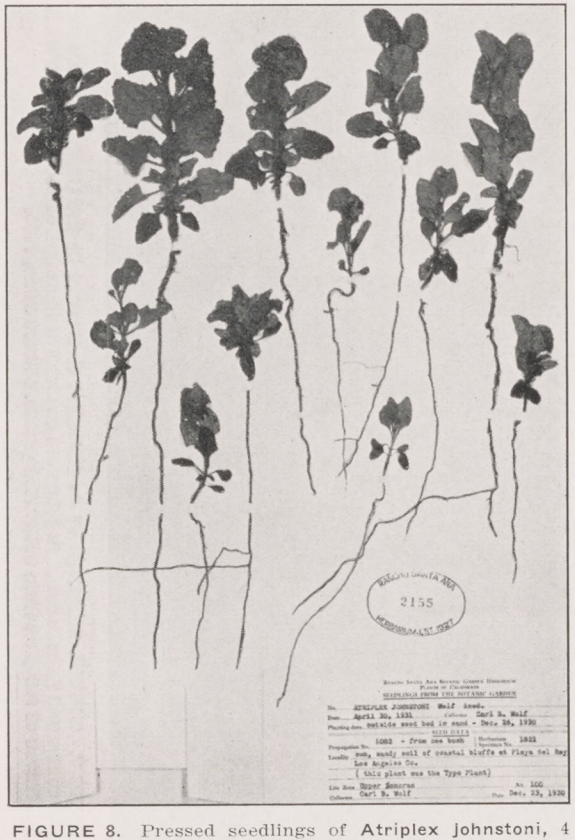

FIGURE 8. Pressed seedlings of **Atriplex johnstoni**, 4 months old from Prop. No. 1082 (from type plant).

FIGURE 9. Pressed seedlings of **Atriplex breweri**, 4 months old from Prop. No. 1080 (from type locality).

FIGURE 10. Plant of **Atriplex johnstoni** in the Garden. Prop. No. 1082, 3½ years from seed, height about 6 ft., heavy load of fruits bending otherwise erect branches. Photo June, 1934.

strosity" placed upon the plant by Hall and Clements, before we should proceed to describe it as a new species.

Material of the Playa del Rey Saltbush was shown to Mr. Theodore Payne, Los Angeles Wild Flower Specialist. He at first thought that the plant might be an horticultural introduction and offered to investigate the cultivated saltbushes of the Santa Barbara region. His findings shed no light on the Playa del Rey Saltbush, but they did disclose that most of the saltbush hedges grown around the Santa Barbara were of *A. halimus* and not of *A. breweri* as many people had long supposed. Specimens of *A. halimus* collected by Mr. Payne from cultivated hedges in Santa Barbara are deposited in Rancho Santa Ana Botanic Garden Herbarium.

From an horticultural standpoint the Playa del Rey Saltbush is well worthy of consideration in Southern California, at least. Its erect growth habit, abundance of blue-green foliage, large drooping clusters of straw-colored fruits, its year-round attractiveness, its ability to thrive in heavy and light soils and its ease of propagation are all features of horticultural merit.

Summary and Conclusions

As a result of our studies and experiments upon the Playa del Rey Saltbush and its comparison with other Californian species we feel justified in describing it as a new species: *Atriplex johnstoni.* A brief summary of some of the outstanding points of these studies is given below:

1. That the species is not a "monstrosity" as Dr. Hall's observations would lead one to believe. Our cultural studies, including germination of seeds, transplants and observations upon flowering and fruiting all bear out the conclusion that the species is normal. However, it is only fair to state that Dr. Hall was perfectly justified in his conclusions at the time. Furthermore his method of pointing out such material under "minor variations" is to be highly commended.

2. The species does not seem to be an horticultural introduction from some other region, for if it were it would seem that there should be specimens or literature in existence.

3. The species seems to be an endemic, apparently a relic of a much wider distribution, but now confined to the small point of land on the coastal bluffs at Playa del Rey, Los Angeles County, California.

4. The species is not closely related to *A. breweri, lentiformis* or *torreyi,* the group with which the Johnston and Parish specimens were placed by Hall and Clements, but has more features in common with *A. hymenelytra,* a spring flowering species of the Colorado and Mojave Deserts. These common features are: somewhat similar leaf structure, stiff woody habit of growth, springtime blooming and fruiting and large corky or spongy fruits. At the same time the species is well separated from *A. hymenelytra* and other known species by its distinctive fruits and leaves.

5. The leaves of the species show marked differences in structure as grown at the seacoast and at the Garden.

6. The Playa del Rey Saltbush has features of horticultural interest which should make it useful in Southern California or other regions with mild climates.

7. The so-called "Santa Barbara Saltbush", which has been used for hedges in the Santa Barbara region is not *A. breweri* as most people had long supposed, but is *A. halimus,* a European species.

OBSERVATIONS ON BACCHARIS PILULARIS DC.

Coyote-Brush or Chaparral-Broom

The species of the genus *Baccharis* number about 250 to 300 and are all confined to the New World. They are dioecious, insect pollinated members of the tribe *Asterae* of the family *Compositae*. In California *Baccharis* is represented by about nine species, all of which are shrubby or at least suffrutescent perennials. Most of the Californian species are gregarious and abundant over considerable area, usually growing in river bottoms and ravines of the Upper and Lower Sonoran Zones, but also in the Humid and Arid Transition Zones. All of these species are abundant seeders and rapidly take possession of disturbed areas. No particular uses seem to have been made of the Californian species, although *B. pilularis* and some other species offer some possibilities as ornamentals as well as some value in erosion control.

This paper attempts to set forth the field, herbarium and cultural studies that have been made by the Garden during the last five years, covering the plants which have been known under the names of *Baccharis pilularis* DC. and *Baccharis consanguinea* DC. These plants are well separated from other Californian species. The only species likely to be confused with them is *Baccharis emoryi* Gray, which in California is confined to the southern part of the state, but it is easily separated by its oblong to linear leaves and its sparsely leafy inflorescence.

Our interest in the plants of *Baccharis pilularis* arose largely because they seemed to offer a fine opportunity for experiments and observations upon the comparative influences of environment and heredity upon the growth form and structure of plants which grow along the seacoast, in contrast to individuals of the same or very closely related forms which grow inland.

Field studies by the Staff have been such a large part of the Garden's program of development that opportunity has been ample for extensive observations of the forms of *Baccharis pilularis* throughout practically all of its range in California and at nearly every season of the year.

Herbarium studies have included not only the material of the Garden Herbarium, but it has also been possible to borrow that of the California Academy of Sciences, the Dudley Herbarium of Stanford University, the University of California Herbarium, Berkeley, the University of California Herbarium, Los Angeles and the Pomona College Herbarium.

Cultural studies have all been made at the Garden. Data, in addition to that summarized here, regarding the propagation and culture are to be found in the permanent records maintained at the Garden.

Baccharis pilularis [1] DC. Prod. 5:407. 1836.

Evergreen shrubs, either prostrate and forming mats 6 in.-2 ft. (1.5-6 dm.) high and 6-15 ft. (2-4.5 m.) across, or erect and usually rounded, forming compact bushes 3-15 ft. (1-4.5 m.) high, usually a little broader than high. Main woody stems ½-3 in. (1.5-8 cm.) in diam., the bark dark brown. Branches and branchlets striated or ridged, mostly thickly clothed with alternate, sessile, dark green or glaucous, resinous or glandular leaves. Blades obovate or oval, obtuse, with 5-9 coarse teeth, these usually above the middle, or occasionally entire, varying in size from less than ¼-1½ in. (5 mm.-4 cm.) long. Heads of the inflorescence numerous, aggregated at the ends of the leafy branchlets. Involucres ovoid or cylindric, with 25-35 well imbricated bracts, these broadly spreading after anthesis and somewhat scarious, containing from 20-50 flowers. Staminate heads about 3/16 in. (5 mm.) high; the flowers with greenish-yellow corollas, the five petal lobes spreading and recurved, stamineal column yellow, pappus dull straw color, about ⅛ in. (3-4 mm.) long, dilated at the tips; achenes abortive. Pistillate heads 3/16-¼ in. (5-7mm.) high; corolla slender, the teeth erect; pappus copious, shining white, exceeding the style in anthesis, in seed very showy, often 5/16 in. (8-10 mm.) long (in old herbarium specimens the pappus often turns to a light tan); achenes 10-nerved, glabrous, light brown. Near the coast the plants flower from August to December, but the main blooming period is in September and October. Inland and in drier situations the blooming period is shorter and depends somewhat upon the fall rains. The achenes mature within a couple of weeks after fertilization.

Habitat. Upper Sonoran, Humid and Arid Transition Zones, mostly at low elevations. Commonly gregarious on open hillsides from Monterey northward, while to the south it occupies more sheltered spots in canyons and ravines, but rarely growing in year-round wet spots as is the case with some other species.

Range. Coastal region from Marshfield, Coos County, Oregon south to San Diego County; Sierra Nevada foothills from Nevada County to Tuolumne County; Santa Barbara Islands.

KEY TO THE SUBSPECIES OF BACCHARIS PILULARIS

Plants prostrate, forming mats 6-15 ft. (2-4.5 m.) across, woody stems weak and flexible, leaves for the most part less than ½ in. (1.5 cm.) long, with about 5 teeth (Central California Coast) . . (a) *typica*

Plants erect, forming erect or rounded shrubs 3-15 ft. (1-4.5 m.) high, woody stems large, stiff, leaves for the most part ½-1¼ in. (1.5-4 cm.) long, with 5-9 teeth (Inland and Coastal) . . (b) *consanguinea*

[1] (pilularis, meaning pill-like or gland-like, in reference to the leaves.)

FIGURE 11. **UPPER.** Plants of **Baccharis pilularis typica** on the sand dunes of San Francisco near 47th Ave. and Ortega St. Photo June 27, 1934. **LOWER.** A fine pistillate plant of **Baccharis pilularis typica** in full seed on the coastal bluffs at Pigeon Point, San Mateo County. This area is one of the finest spots for this subspecies. The plant in the foreground was but a few inches in height, but had a spread of 8 to 10 ft., from it was collected Herb. No. 6240. Photo November 9, 1934.

(a). **Baccharis pilularis typica** C. B. Wolf, new name.

Prostrate shrub, forming mats usually about 6 in. (1.5 dm.) high, but occasionally somewhat higher (especially at the center), spreading 6-15 ft. (2-4.5 m.), following the undulations of the ground, but seldom rooting on

the underside of the prostrate branches. Main stems flexible, rarely over ½ in. (1.5 cm.) in diam. Branchlets mostly turned to one side (upward) of the prostrate branches (this evident in many pressed specimens). Leaves mostly ⅜-½ in. (5-15 mm.) long, with 4-6 teeth, rarely more or entire. (*Baccharis pilularis* DC. l. c.)

Habitat. Exposed and usually wind-swept sand dunes and bluffs along the coast in association with *Eriophyllum staechadifolium artemisiaefolium, Lupinus arboreus, Erigeron glaucus* and other plants characteristic of this coastal belt of the Humid Transition Zone (Fig. 11).

Range. Russian River, Sonoma Co., southward to Pt. Sur, Monterey County, extending inland to Berkeley, Alameda County.

Type Locality. "in California legit cl. Douglas". It seems probable that Douglas collected the specimens around San Francisco, although it is possible that they came from Monterey where he obtained most of his material.

Specimens Examined. Sonoma County: 2 4/10 mi. no. of mouth of Russian River, *C. B. Wolf & E. R. Johnson,* Herb. No. 6181 (RSA, DS, CA, P, UC, AA, M, UCLA, US). Marin County: Pt. Reyes Peninsula, *J. T. Howell* 11702 (CA); near pipe line bridge, Mt. Tamalpais, *H. L. Mason.* Mar. 18, 1922 (DS). San Francisco County: San Francisco, *Bolander* 2373 (UC), 2450 (UC), *T. S. Brandegee,* Sept. 1901 (UC), no date (DS), *G. B. Grant,* May 12, 1900 (DS), *M. E. Jones* 2382 (CA, DS, UC, P); Lake Merced, *J. T. Howell* 705 (CA); Presidio, *Michener & Bioletti,* Sept. 1892 (UC); Cliff House, *Lemmon Herbarium* (UC); Fort Point, *Bioletti,* Aug. 1891 (CA, UC); Presidio, *Bioletti,* July 1891 (UC); 47th Ave. & Noriega St., Herb. No. 2339 (RSA, DS, CA, P, UC); Estero Station on 19th Ave., Herb. No. 5741 (RSA, DS, CA). San Mateo County: Pillar Point, *C. F. Baker* 1740 (CA, DS, UC, P); Tunitas, *L. R. Abrams* 5137 (DS); 4 mi. so. of Pescadero, along the coastal bluffs, Herb. No. 1807 (RSA, DS, CA, P, AA, UCLA, CI); near mouth of Arroyo de Los Frijoles, *H. L. Mason,* Mar. 27, 1922 (DS); Pigeon Point, Herb. No. 6240 (RSA, DS, CA, P, UC, AA, M, UCLA, US, Gr, NY) (Fig. 11, Lower). Monterey County: Moss Landing sand dunes, *L. R. Abrams* 4085 (DS, UC); Point Sur, Herb. No. 6226 (RSA, DS, CA, P, UC, AA, M, UCLA, US). Alameda County: West Berkeley, *I. J. Condit,* Jan. 28, 1913 (UC).
Specimens Collected From Cultivated Plants at Rancho Santa Ana Botanic Garden by P. C. Everett: Herb. No. 6044, from pistillate seed grown plants of Prop. No. 1516 (RSA, DS, CA, P, UC, AA, M); Herb. No. 6045, from staminate seed grown plants of Prop. No. 1516 (RSA, DS, CA, P); Herb. No. 6068, from pistillate seed grown plant of Prop. No. 1063 (RSA, DS, CA, P, UC, AA, M, UCLA); Herb. No. 6069, from staminate seed grown plant of Prop. No. 1063 (RSA, DS, CA, P, UC, AA, M, UCLA, US); Herb. No. 6246, from pistillate seed grown plant of Prop. No. 1063 (RSA, DS, CA, P, UC) (Fig. 12, Center).

(b). **Baccharis pilularis consanguinea**[1] (DC.) C. B. Wolf, new comb.

Erect or rounded shrubs 3-15 ft. (1-4.5 m.) high, usually a little broader than high. Main stems stiffly erect, often 1-3 in. (2.5-7.5 cm.) in diam. Branchlets more or less evenly disposed around the branches. Leaves ½-1½ in. (1.5-4 cm.) long, with 5-9 teeth or occasionally entire. (*Baccharis consanguinea* DC. Prod. 5:408. 1836).

Habitat. Open situations of the Humid Transition Zone, somewhat more sheltered where found in the Upper Sonoran Zone, also lower edge of Arid Transition Zone in the Sierra Nevada foothills. Commonly abundant on disturbed areas where it spreads rapidly by root suckers and seeds.

Range. Coastal region from Marshfield, Coos County, Oregon south to San Diego County; inland to Trinity, Yolo, Napa, San Benito and Los Angeles Counties; on San Miguel, Santa Rosa, Santa Cruz, Anacapa and Santa Catalina Islands.

Type Locality. "in California legit cl. Douglas." As suggested under *typica*, Douglas probably obtained the type from San Francisco or Monterey. Both subspecies grow at both places, but at present *consanguinea* is most abundant at Monterey, while *typica* is most abundant at San Francisco (Fig. 11, Upper).

Specimens Examined. Oregon. Coos County: Marshfield, *W. Haydon*, April 20, 1934 (CA); Isthmus Slough, *Abrams & Benson* 10568 (DS). Curry County: 7 mi. no. of Gold Beach, *D. K. Kildale* 6157 (DS); 1½ mi. no. of Brookings, *D. K. Kildale* 6740 (DS); Gold Beach, *J. W. Hoyt* 104 (DS); Pistol River near ocean, *L. F. Henderson* 11451 (UC); Brookings, *J. H. Thompson* 159 (DS). California. Del Norte County: Requa, *C. D. Duncan* 342 (DS); west of Requa, *E. A. McGregor*, Aug. 1, 1921 (DS); Klamath River, 1 mi. above Terwat, *C. D. Duncan* 377 (DS); Klamath Glen, *D. K. Kildale* 5750A (DS). Humboldt County: near ocean, 1 mi. so. of Orick, *C. B. Wolf* 815 (DS); Arcata, *C. C. Marshall*, in 1888 (UC); *J. P. Tracy* 6565 (DS, CA, P, UC); mouth of Eel River, *D. K. Kildale* 1441 (DS); Chaparral Mt. at Bug Creek, *L. B. Kildale* 10488 (DS); 4 mi. above mouth of South Fork of Eel River, *J. P. Tracy* 5107 (UC); Alton Bluff, *D. K. Kildale* 2845 (DS); Alton, *J. P. Tracy* 4003 (UC); coast at Devils Gate, so. of Cape Mendocino, *C. B. Wolf* 1219 (RSA, DS); Hoopa Valley, *C. D. Duncan*, Sept. 22, 1920 (DS). Trinity County: Hennessey Road, leading up South Fork of Trinity River, *J. P. Tracy* 7808 (UC). Mendocino County: near Blackberg, *L. R. Abrams* 5969 (DS); Mendocino, *M. E. Jones* 29122 (UC); Big River, *J. I. McMurphy* 340 (DS). Sonoma County: Duncan Mills, *M. E. Jones*, July 8, 1882 (DS, UC). Marin County: Olema, *E. Nelson*, Dec. 1898 (UC); Inverness, *J. McDonald*, Aug.

[1] (consanguinea, meaning close of kin; probably in reference to the close resemblance to **pilularis.**)

FIGURE 12. **UPPER.** Ground cover plantings of **Baccharis pilularis typica** (Prop. Nos. 1063 & 1516) east of Administration Building. Photo June, 1933. **CENTER.** Plant of same from above planting (Prop. No. 1063) forming a dense mat over 8 ft. across. Photo Jan. 30, 1935. **LOWER. Baccharis pilularis consanguinea** at San Clemente, Orange County. Pistillate plant 5 ft. high, 6 ft. spread. (Herb. No. 6262, Prop. No. 2310-seed). Photo Dec. 26, 1934.

1914 (CA); Mt. Tamalpais, *A. Eastwood,* 2307 (CA), *P. A. Munz* 6440 (P). Napa County: Napa River levee at Cuttings Wharf, *J. T. Howell* 10802 (CA); St. Helena, *W. L. Jepson,* Oct. 22, 1892 (UC). Yolo County: foothills west of Dunnigan, near Buckeye Creek, *R. Stinchfield* 353 (DS). Alameda County: Berkeley, *H. A. Walker* 462 (CA, P, UC), *J. B. Davy,* Oct. 23, 1898 (UC), *C. Epling* 5240 (UCLA); West Berkeley, *H. A. Walker* 475 (UC); Berkeley Hills, *J. P. Tracy* 1966 & 1968 (UC), *W. L. Jepson* 5298 (DS); near the President's Cottage, Mills College, *B. La Coste,* Oct. 1920 (DS); Leona Hills, *H. E. McMinn* (DS); Niles Canyon, *E. E. Stanford* 742 (P). San Mateo County: near San Francisquito Creek, *W. R. Dudley,* Oct. 19, 1895 (DS); Portola, *A. D. E. Elmer* 4576 (DS, CA, P, UC); Rockaway Beach, *F. W. Peirson* 6425 (P). Santa Clara County: Stanford University, *L. R. Abrams* 2240 (DS, P); Black Mt., *C. F. Baker* 60 (DS, CA, P, UC); Loma Prieta, *J. B. Davy* 628 (UC); Page Mill Road, *R. A. Kocher,* April 25, 1905 (UCLA); Stevens Creek, near Mountainview, *J. D. Randall,* Oct. 19, 1907 (DS); hills back of Los Gatos, *A. A. Heller* 7210 (DS, P, UC); Los Buellos Hills, (*Parish*), Aug. 1905 (DS). Santa Cruz County: Glenwood, *H. Davis,* in 1907 (CA); Santa Cruz Mts., *H. Davis* 47 (UC); Camp Idle, Santa Cruz Mts., H. Davis 116 (UC). Monterey County: near Castroville, *W. R. Dudley,* Nov. 12, 1893 (DS); Monterey, *Mrs. J. Clemens,* Aug. 25, 1910 (P); Pacific Grove, *A. D. E. Elmer* 4085 (DS), *A. A. Heller* 7202 (DS, P, UC); San Jose Canyon, *J. D. Randall,* Dec. 28, 1909 (DS); Big Sur, *A. Eastwood* 14004 & 14005 (CA); King City along east bank of Salinas River, *A. R. Taylor,* Oct. 1915 (UC). San Benito County: The Pinnacles, *A. Eastwood* 6748 (CA); Tres Piños, *C. B. Wolf* 1392 (RSA, DS, CA). San Luis Obispo County: Port Harford, *J. B. Davy* 2715 (UC). Santa Barbara County: summit of San Marcos Pass, *J. Ewan* 5318 (CA, P); Loma Alta, *S. B. Parish* 11038 & 11038A (DS); Prado, *G. Newell,* Aug. 1913 (CA); Santa Barbara, *J. B. Grant,* Oct. 28, 1897 (DS). Ventura County: Casitas Creek, *L. R. Abrams,* July 25, 1908 (DS). Los Angeles County: slopes of Santa Monica Range, *H. E. Hasse,* Aug. 1890 (DS); Santa Monica Canyon, *J. H. Barber,* July 3, 1898 (UC); Newhall (this locality needs confirmation), *J. C. Nevin* (DS). Orange County: San Clemente, *B. D. Stark,* Herb. No. 4523 (RSA, DS, CA), Herb. No. 6262. (RSA, DS, CA, P, UC, AA, M, UCLA, US, Gr, NY, SD) (Fig. 12, Lower). San Diego County: 6½ mi. so. of San Clemente, Herb. No. 5409 (RSA, DS), abundant; San Luis Rey River, 2 mi. E. of Oceanside, Herb. No. 6263 (RSA, DS, CA, P, UC, AA, M, UCLA, US, Gr, NY, SD); Torrey Pines, Herb. No. 6273 (RSA, DS, CA, P, UC). San Miguel Island: *E. L. Greene,* Sept. 1886 (UC). Santa Rosa Island: sand dunes, northwest end of island, *P. A. Munz* & *E. Crow* 11751 (P); *N. Dunn,* May 24, 1931 (UCLA). Santa Cruz Island: hills above Valdez, *R. Hoffman,* Nov. 8, 1930 (P); east of Valdez, *R. Hoffman,* Nov. 10, 1930 (P); Valdez, *M. E. Jones,* Sept. 5, 1927 (P); Hazard's, *P. A. Munz* & *E. Crow* 11552 (P); Prisoners' Harbor, *A. L. Grant* 1737 (P); ½ way between Prisoners' Harbor and the Main Ranch, Herb. No. 4141 (RSA, DS, CA, P, UC, AA) and Herb. No. 4142 (RSA, DS, CA, P). Anacapa Island: R. Hoffman, June 15, 1930 (CA). Santa

Catalina Island: near Little Harbor, *Knopf & Johnson,* Herb. No. 1466 (RSA, DS, UC); Middle Ranch Canyon, *M. B. Dunkle* 2009 (P); *G. C. Roeding,* Feb. 18, 1922 (CA). Nevada County: 4 mi. so. of Grass Valley on the road to Auburn, *C. B. Wolf & E. R. Johnson,* Herb. No. 6147 (RSA, DS, CA, P, UC, AA, M, UCLA, US). El Dorado County: ½ mi. above El Dorado on the road to Placerville, *C. B. Wolf & E. R. Johnson,* Herb. No. 6142 (RSA, DS, CA, P, UC, AA) & Herb. No. 6143 (RSA, DS, CA, P, UC, AA, M, UCLA, US, Gr, NY). Amador County: Ione, *E. Braunton,* 1219 (DS, UC), Sept. 1904 (DS), *A. Eastwood* 10157 (CA), *G. Hansen* 1416 (P). Tuolumne County: Spring Gulch, vicinity of Rawhide, *R. Stinchfield* 98 (DS).

Minor Variations

1. *Baccharis pilularis typica*, but with entire leaves: *H. L. Mason,* Mar. 18, 1922, from Mt. Tamalpais, Marin Co., as to part of the collection (DS, sheet no. 123332).

2. *Baccharis pilularis consanguinea,* but far out of range of the rest of the subspecies and represented by only a single collection: *E. L. Greene,* May 2, 1885, from San Quentin, Baja California (UC). This material needs verification as to its source; also it is possible that it represents another species.

3. *Baccharis pilularis,* material representing intermediates between subspecies *typica and consanguinea,* or material not definitely assignable to one or the other subspecies. These specimens all seem to have come from the areas where the two subspecies meet in distribution (the spots where such doubtful or intermediate material would be expected). An ideal area for the observation of the intergradation between the two subspecies is on Pt. Reyes, Marin Co., where the individuals are abundant and cultivation has not disturbed the natural distribution. Specimens referable here: along the coast 2 4/10 mi. no. of the mouth of the Russian River, Sonoma Co., *C. B. Wolf & E. R. Johnson,* Herb. No. 6182 (RSA, DS, CA, P, UC, AA, M, UCLA, US), this grew with *typica* (Herb. No. 6181), but differed in having somewhat higher growth and stiffer, larger stems; San Francisco, *Bioletti,* August 1892 (DS), *E. L. Greene,* in 1891 (UC), *I. Tidestrom,* Sept. 16, 1893 (UC), *A. Eastwood,* Aug. 1915 (CA), *Michener & Bioletti,* Sept. 1892 (DS, only); West Berkeley, *J. B. Davy,* June 9, 1895 (DS, UC); Alameda, *McClean,* Aug. 1872 (UC); Alameda Point, *Rattan Herb.,* Aug. 1880 (DS); Oakland, *V. K. Chestnut,* in 1888 (UC).

Since the days when David Douglas first collected the specimens which were subsequently described as *Baccharis pilularis* and *consanguinea* by De Candolle, there has been considerable question as to how to treat these two species.

Baccharis pilularis was described by De Candolle as "fruticulosa" and *B. consanguinea* as "fruticosa", thus indicating that Douglas' notes must have included data regarding the prostrate and erect growth forms. Subsequent botanists treating these two plants have, with the exception of E. L. Greene,

used the name *pilularis* and have reduced *consanguinea* to synonomy or ignored it entirely. Their descriptions have been largely drawn up to fit the erect forms and have given only the briefest statement that a prostrate form grows along the exposed spots near the coast.

E. L. Greene described *B. pilularis* as a species as "low, slender, the depressed or prostrate diffusely branching stems 1-1½ ft. long" and *B. consanguinea* as a species as "compactly branching evergreen 8-12 ft. high" (Man. Bay Reg. 182. 1894).

The late Dr. H. M. Hall was much interested in experimental taxonomy of the sort that attempted to determine the relative influences of heredity and environment upon plants. In a discussion with him at Palo Alto in 1931 I told him of the experiments with *Baccharis pilularis* at Rancho Santa Ana Botanic Garden. He related that at one time he had made some transplants of the prostrate *pilularis* to a sheltered, shady spot in his yard at Berkeley, and that the plants had continued to grow prostrate.

Dr. Hall's only published reference to the distinctness of *B. pilularis* and *consanguinea* seems to have been in his monograph of the Genus Haplopappus (Carn. Inst. Wash. Publ. 389:264. 1928) where, in speaking of the ecology and uses of *Haplopappus ericoides,* he mentions *"Baccharis pilularis* (in the prostrate *consanguineus form*)". This certainly must have been an unintentional error on the part of Dr. Hall, for if the prostrate form is to be given nomenclaturial recognition, the name *consanguinea* can not be applied, but must be reserved for the erect plants as originally delimited by De Candolle.

The plants of *Baccharis pilularis* have been known under the common names of Coyote-Brush and Chaparral-Broom, but it is likely that these names have only been applied to subspecies *consanguinea.*

Cultural Studies

A summary of the data covering the plantings of *Baccharis pilularis* DC. is given below:

1. *Baccharis pilularis consanguinea* (Propagation No. 707). This collection was obtained from near Little Harbor, Santa Catalina Island, Feb. 1, 1930 by Knopf & Johnson, Herb. No. 1466. They obtained 172 small plants. On March 26, 1930 there were 130 of these planted in the Garden. Of these, 117 were reported as alive on October 1, 1933 and ranged in height from 4 to 6 ft. On June 2, 1933 a number of these plants were measured and the ratio of height to spread was found to be 1: .83. On Sept. 14, 1934 a number of these plants were again measured and gave the following data: range in height—51-98 inches; range in spread—51-114 inches; average height—68.7 inches; average spread—76.4 inches; ratio of height to spread—1: 1.11. These plants are now as large as the average wild *consanguinea* and it is unlikely that the ratio of height to spread will change greatly. They are representative of the plants which have been cited as *B. pilularis consanguinea* (Fig. 13, Lower).

2. *Baccharis pilularis typica* (Propagation No. 1063). This collection was made on the coastal bluffs, 4 mi. so. of Pescadero, San Mateo County, Nov. 5,

1930, Herb. No. 1807. The seeds and herbarium material were all taken from a single plant about 6 inches high and 12 ft. spread. The seeds were planted on Dec. 5, 1930 in an outside seed bed in sand. Germination was good and the seedlings were soon thick in the bed. Despite this crowded condition the plants were distinctly prostrate, except for a very few erect ones. Some of these young seedlings were dug and mounted in as normal a position as possible on May 6, 1931 (Fig. 13, Right). By November, 1931, 137 plants had been grown to 6 inch pots. Of these, only 5 appeared to be at all likely to grow into strictly erect plants. The others were prostrate with branches trailing down over the edges of the pots (Fig. 13, Upper). On November 25, 1931, 51 of these plants were set out in the Garden, just west of the planting of the Catalina collection (Prop. No. 707). Measurements of these plants taken on June 2, 1933 gave the following data: range in height—3-28 inches; range in spread—16-66 inches; average height 10.7 inches; average spread—38.5 inches; ratio of height to spread—1:3.60. Similar measurements of these same plants taken on Sept. 14, 1934 gave the following data: range in height—3-33 inches; range in spread—45-90 inches; average height—14.5 inches; average spread—64.2 inches; ratio of height to spread—1:4.40. These latter figures show a distinct increase in the spread of the plants with very little increase in their height and it seems likely that additional growth will result in greater spreading without much increase in height. Some individual plants have already formed mats very like those of *typica* on the seacoast.

3. *Baccharis pilularis typica* (Propagation No. 1516). This collection was made on the sand dunes of San Francisco at 47th Ave. and Noriega St., Aug. 21, 1931, Herb. No. 2339. The seeds and herbarium material were all taken from a single plant about 6 inches high and with a spread of 6 ft. These seeds were planted in an outside seed bed in sand on Jan. 19, 1932. The young seedlings showed the same prostrate growth habit as did those of Prop. No. 1063. Some of these were pressed in as normal a position as possible on June 14, 1932 (Herb. No. 3730). On May 29, 1933, 6 of these plants were placed in the Garden adjacent to the plantings of the Catalina and Pescadero plants. Measurements of these 6 plants taken on Sept. 14, 1934 gave the following data: range in height—7-17 inches; range in spread 30-41 inches; average height—11.6 inches; average spread—35.8 inches; ratio of height to spread—1:3.07. The performance and measurements of these plants are in general agreement with the results obtained from the Pescadero culture (Prop. No. 1063).

4. *Baccharis pilularis typica* (Prop. Nos. 1063 and 1516). Surplus plants of these two lots were set out as a ground cover on an area to the east of the Administration Building. These have been given greater amounts of water than the plants in the Garden beds and have grown somewhat faster. They have shown considerable variation in habit, ranging from low mats a few inches high and with 6-8 ft. of spread to some bushes over 2 ft. high. None of them are strictly erect in habit, but a few were characteristically intermediate between *consanguinea* and *typica*. With a little selection of individuals it would

FIGURE 13. UPPER. Baccharis pilularis typica (Prop. No. 1063) one year old in 6 inch pot. Photo Nov. 1931. LOWER. Baccharis pilularis consanguinea (Prop. No. 707) about 25 inches high in Garden bed. Photo spring of 1931. RIGHT. Pressed seedlings of Baccharis pilularis typica (Prop. No. 1063), 5 months old, illustrating prostrate growth.

seem that a very uniform low mat plant could be obtained for use as a ground cover, having as its advantages a fine dark green color at all seasons of the year and a low water requirement (Fig. 12, Upper & Center).

Morphological Studies

The fresh woody stems of *typica* are characteristically flexible and even in very old plants do not become large in diameter, while those of *consanguinea* are stiff and usually grow to a couple of inches or more in diameter. In an effort to ascertain if structural differences could be definitely located in the wood of these two subspecies, Mr. H. Victor Hansen, graduate student in botany, Pomona College, prepared microtome cross sections of fresh wood of Prop. Nos. 707, 1063 and 1516. From these sections he made camera lucida drawings of Prop. Nos. 707 and 1063. The differences of structure as shown in cross sections were not readily apparent, although some slight differences in average size of cells and cell walls could be seen. Additional studies, using a slightly different technique, might enable one to determine what makes the wood of these two subspecies so characteristically flexible in the case of *typica* and so rigid in the case of *consanguinea*.

Summary and Conclusions

Field and herbarium studies have shown that the prostrate *Baccharis pilularis typica* occupies a distinct geographic area along the coast from Sonoma to Monterey Counties, California; that *B. pilularis consanguinea,* the erect form, surrounds this area but extends over a much greater range and that where these two forms meet there is a considerable number of plants more or less intermediate between the two. In view of these data it has seemed that the recognition of *typica* and *consanguinea* as subspecies is in keeping with the generally accepted idea as to what constitutes a subspecies.

Lack of *typica* on the coast north of Sonoma County, south of Monterey County and on the Santa Barbara Islands seems to indicate that the subspecies is much more than a mere ecological adaptation, since if this was the case, the wind-swept Santa Barbara Islands and parts of the Northern California coast would seem to afford ideal conditions for the development of the prostrate form.

Cultural studies have demonstrated that the prostrate growth habit of *typica* is an hereditary character transmitted through the seeds. The small percentage of intermediates (semi-erect plants) and the somewhat higher average growth of most of the other plants of *typica* seems to be explained as follows: both Prop. Nos. 1063 and 1516 came from areas where they might have been cross pollinated with *consanguinea* or with intermediate material; the general higher growth of the plants under cultivation at the Garden might be considered to be the maximum to which the plants are capable of growing when removed from the coastal environment which seems to have a depressing influence on almost all species.

No adequate explanation can be offered as to why *typica* has not spread inland any great distance, for the seeds are well adapted for dispersal by wind and they germinate and grow easily under cultivation. Perhaps there are barriers of a nature not easily recognizable.

A conclusion derived from these studies of *Baccharis pilularis* is that a number of other maritime forms should be studied and tested to determine whether they are merely ecological adaptions to a coastal environment or are maritime subspecies capable of retaining their identities even when grown away from the coast.

CALIFORNIA PLANT NOTES I

Pinus attenuata Lemmon, Garden & Forest 5:65. 1892.
P. tuberculata Gord. Hort. Soc. Lond. 4:218. 1849.

The Knob-Cone Pine has long been known in Southern California from the area around City Creek in the San Bernardino Mts. There is another grove in the Santa Ana Mts. scattered over an area of about three-fourths of a mile in every direction from the summit of Pleasants Peak (4005 ft.), formerly known as Sugarloaf Peak. According to Ranger J. B. Stephenson, this grove was known to him over twenty-five years ago and he sent specimens to the Forest Service offices for identification. The grove consists of at least a thousand trees, some of which are so well outlined against the skyline that on a clear day they may be seen from the Corona or Santa Ana side of the mountains. COLLECTIONS: Orange County:—*B. D. Stark* (cones only), May 1932 (RSA); *B. D. Stark*, Herb. No. 4501 (RSA); Herb. No. 6259 (RSA, DS, CA, P, UC, AA, M, UCLA, US, Gr, NY, SD). Riverside County:—Herb. No. 6260 (RSA, DS, CA, P, UC, AA, M, UCLA, US, Gr, NY, SD).

Juniperus californica Carr. Rev. Hort. 1854:352 f.21. 1854.

The California Juniper is a widespread species in California and although long known from the Inner Coast Ranges east of the Salinas Valley, it does not seem to have been reported from the Santa Lucia Mts. Prof. W. R. Dudley seems to have been the first to have collected it in the Santa Lucias, having collected it on Dec. 31, 1895 in the hills east of a branch of the Arroyo Seco (DS). It also grows along the road from Jolon to the coast, just above the Nacimiento Camp Grounds, or about 18 miles from Jolon: Herb. No. 6224, Nov. 6, 1934 (RSA, DS, CA, P).

Juniperus occidentalis Hook. Fl. Bor. Amer. 2:166. 1838.

In the Lake Tahoe region along the trail between Gilmore Lake and Glen Alpine Springs at about the 8000 ft. level stands a juniper which is so outstanding in size of trunk that it merits recognition. I propose to call it the GILMORE JUNIPER. The tree was measured with a rule by Mr. E. I. Applegate and me and the following figures were obtained: height 50 ft.; spread 30 ft.; circumference of trunk at ground 40 ft.; circumference of trunk at 4 ft. above the ground 36 ft.; shortly above this it forked into two main branches each of which would be considered a good-sized juniper. COLLECTION: Herb. No. 2415, Sept. 9, 1931 (RSA-with photo, DS, CA).

Zannichellia palustris Linn. Sp. Pl. 969. 1753.

This species does not seem to have been previously collected or reported from Santa Catalina Island. It was found in abundance in brackish water at Little Harbor on the west side of the island: Herb. No. 3591, May 12, 1932 (RSA, DS, CA, P, UC).

Eichornia crassipes Solms. in DC. Monog. Phan. 4:527. 1883.
Piaropus crassipes (Mart.) Britt. Ann. N. Y. Acad. Sci. 7:241. 1893.

The Water-Hyacinth has been reported as established in Yolo, Fresno and San Bernardino Counties (Abrams, Ill. Fl. Pac. St. 1:349. 1923) and in Fresno and San Bernardino Counties (Jepson, Man. Fl. Pl. Calif. 195. 1923). The species is also found in pools of the Santa Ana River on Rancho Santa Ana, Santa Ana Cañon, Orange County. The pool from which the following collection was made was so thoroughly covered with the plants that the water could scarcely be seen. Collection: E. R. Johnson, Herb. No. 3808, June 29, 1932 (RSA).

Sporobolus wrighti Munro, ex Vasey, Cat. Gr. U. S. 26. 1883.

This species does not seem to have been collected here-to-fore in California. Collection: Herb. No. 3181, April 30, 1932, along the Colorado River near the Parker Ferry, San Bernardino Co. (RSA, DS, CA, P, UC, M, UCLA, A. S. Hitchcock). The specimens were determined by Dr. A. S. Hitchcock in 1934.

Cutandia memphitica (Spreng.) Richt.

This European grass is to be added to the list of introduced plants of California, and apparently also of the New World, by its collection near Devil's Cañon Forest Service Nursery, Devil's Cañon, San Bernardino Mts., *B. D. Stark*, Herb. No. 4989, May 18, 1933 (RSA, DS, A. S. Hitchcock). The above material was determined by Dr. A. S. Hitchcock in 1934, who noted that it was the "first known collection from America".

Chloris gayana Kunth, Revis. Gram. 1:89. 1829.

This grass has been introduced into California as a forage plant and has now become naturalized in waste ground on the Bryant Ranch near Long Beach, Los Angeles County, along the west side of the San Gabriel River Flood Control, about 1400 ft. south of 7th St. Collection: Herb. No. 4121, Sept. 16, 1932 (RSA, DS, CA, P, UC, A. S. Hitchcock). The material was determined by Dr. A. S. Hitchcock in 1934, who noted that it was the "first received from California".

Yucca mohavensis Sarg. Garden & Forest 9:104. 1896.

Throughout most of its range the Mojave Yucca is characterized by having leaves of a yellowish-green. In Morongo Valley, San Bernardino County there is considerable area where the individuals of this species are characterized

by having glaucous, blue-green leaves, thus giving the plants a very different aspect from the usual yellowish-green form. COLLECTION: Herb. No. 4285, Oct. 11, 1932 (RSA, DS, CA, P, UC, AA, M, UCLA, US, Gr, NY). At the same time and from the same plant seeds were obtained for propagation (Prop. No. 1596). The seedlings from this collection have from the first shown the same blue-green leaves that were characteristic of the parent. This blue-green strain of the Mojave Yucca is perhaps of some botanical interest, but may be of more interest horticulturally.

Yucca whipplei Torr. Bot. Mex. Bound. 222. 1869.

No accurate data seem to be available regarding the length of time required for this species to flower when grown from seed.

The following data are from a collection by E. R. Johnson (Prop. No. 15) from Claymine Cañon, Santa Ana Mts., Jan. 16, 1927: the seeds were planted in the nursery on March 10, 1927; from these, 82 plants were set out in the Garden on March 1, 1928; 77 of these plants were reported as alive on Oct. 1, 1933; bloom spikes appeared on seven plants in the spring of 1934, of which four set fertile seeds, indicating that the Yucca Moth had found these plants which were at least a mile from any wild plants.

From the above data it would seem that a minimum of seven years is required for this species to bloom when grown from seed and that even then less than ten per cent flowered.

It is of further interest to note that in all of the above plants that flowered, the plants died without leaving side shoots. It has been asserted that some strains of this species regularly produce offshoots that continue to grow after the main plant has bloomed and died. Confirmation of this would be of great horticultural value.

Agave deserti Engelm. Trans. Acad. St. Louis 3:310. 1875.

A. consociata Trel. Rep. Mo. Bot. Gard. 22:53. 1911.

This agave has long been known from around the western and northern borders of the Colorado Desert. It has also been found sparingly in the Whipple Mts., bordering the Colorado River, San Bernardino County, where it was collected a short distance west of the Copper Basin: Herb. No. 3165, April 30, 1932 (RSA, DS, CA, P, UC). Flowering stalks at this station attained heights of sixteen to eighteen feet. The species probably grows in the Chemeheuvis Mts., a short distance to the north of the Whipple Mts., for a single dead (loose) plant was noted a few days later in a wash on the west slope of the Chemeheuvis Mts., on the road from Vidal to Needles.

Beta vulgaris Linn. Sp. Pl. 222. 1753.

This species is to be added to the list of plants naturalized on Santa Catalina Island. It was found in considerable quantity in the heavy alkaline soil bordering Catalina Harbor: Herb. No. 3579, May 12, 1932 (RSA, DS, CA, P, UC).

Bassia hyssopifolia (Pall.) Kuntze, Rev. Gen. Pl. 1:547. 1891.

This species seems to be destined to become a dominant and aggressive weed in many of the more alkaline spots of California. It has been collected in the San Joaquin Valley, 4 7/10 mi. west of Los Banos, Merced County, *J. Clausen* 603, Sept. 9, 1932 (RSA). East of Long Beach on the Bryant Ranch it has been collected in both Los Angeles and Orange Counties as follows: *J. Snow,* in the spring of 1932 (RSA); Herb. Nos. 4025 (RSA), 6048 (RSA, DS) and 6059 (RSA, DS). On some cultivated areas of the Bryant Ranch this species has already become a dominant plant and seems to be replacing such species as the annual *Suaedas.*

Atriplex hymenelytra (Torr.) Wats. Proc. Amer. Acad. 9: 119. 1874.

The Desert-Holly is well known as a Christmas decoration because of its beautiful silvery-gray, toothed leaves. In late spring or early summer the plants of this species growing on the deserts present another color phase that is just as attractive. They seem to have been dipped in that same gorgeous purple that is so distinctive of distant views of the desert landscape. I first saw the Desert-Holly thus colored at the north base of Signal Mt., Imperial County in May of 1931. There the staminate plants were deeply tinged with purple while the pistillate plants with maturing fruits had not yet turned from the usual gray color.

Platanus racemosa Nutt. No. Amer. Sylva 1:47. 1842.

This species and *Platanus wrighti* S. Wats. of Arizona and New Mexico have been little confused, since their distributions do not overlap. The two main characters upon which they are separated are: 1. sessile vs. stalked fruiting heads; 2. short leaf lobes vs. long leaf lobes.

Examination of a large amount of herbarium material of these two species shows that these distinctions tend to break down. *P. wrighti,* although usually bearing stalked fruiting heads, may have both sessile and peduncled inflorescences, even upon the same tree: *C. B. Wolf* 2419, June 30, 1928, from Soda Springs, Beaver Creek, Yavapai County, Arizona (RSA, DS, CA). In *P. racemosa* stalked fruiting heads are not uncommon in material from as far north as central California: *E. I. Applegate* 618, April 1895, Alum Rock, Santa Clara County (RSA, DS). However, in the desert regions of southern California the few stands of P. *racemosa* are characteristically found with stalked or peduncled fruiting heads: Herb. No. 3647, May 24, 1932, from Snow Creek at the north base of Mt. San Jacinto, Riverside County (RSA, DS, CA, P, UC, AA); *B. D. Stark,* Herb. No. 5555, Nov. 1933, from San Andreas Cañon, Riverside County (RSA, DS, CA, P, UC, AA, M, UCLA, US, Gr, NY). This latter collection, particularly, has deeply lobed leaves, closely resembling those of *P. wrighti,* and it is even possible that it should be referred to that species.

It seems probable that *P. racemosa* and *P. wrighti* are in reality much more closely related than has been supposed, as is evidenced by the breaking

down of the main characters upon which they have been separated. Since the Californian material which is more or less intermediate between *P. racemosa* and *P. wrighti* is largely confined to the desert areas, its distribution is in accord with the principle that intermediates or break-downs between species or subspecies should be found in the areas where the two forms overlap. Of course at the present time there is a gap of many miles across the Colorado Desert where no native sycamores are known to occur.

Adenostoma sparsifolium Torr., in Emory, Notes Mil. Rec. 140. 1848.

The northern limit of distribution for this species has been given generally as the San Jacinto Mts., but M. S. Baker collected a specimen in Santa Barbara County in July 1895 (UC, P) and Ralph Hoffman reported the species in the Cuyama Valley in Madrono 1:225. 1929.

The species is abundant along the south side of the Cuyama River, 2 8-10 miles above Clear Creek, Santa Barbara County: Herb. No. 4413, Nov. 18, 1932 (RSA, DS, CA, P, UC, AA, M, UCLA, US, Gr, NY). This locality is the extreme northern point of Santa Barbara County, marked by the northernmost bend of the Cuyama River. Across the river on the San Luis Obispo County side the species was also noted.

The species also occurs in the Santa Monica Mts., Los Angeles County: *B. D. Stark,* Herb. No. 4421, Nov. 20, 1932, Lobo Cañon, 1000 ft. (RSA, DS, CA, P, UC, AA); *H. E. Hasse,* Oct. 1910, from the head of Topango Cañon (DS).

Photinia arbutifolia (Ait.) Lindl. Trans. Linn. Soc. 13: 103. 1821.

Two varieties of the California Toyon have been described in recent years: *P. arbutifolia cerina* Jepson, Man. Fl. Pl. Calif. 508. 1925, based on specimens with yellow fruits from Templeton, San Luis Obispo County; *P. arbutifolia macrocarpa* Munz, Bull. South Calif. Acad. Sci. 31: 64. 1932, based on large fruits and with distribution given as San Clemente and Santa Catalina Islands.

Our field studies on the mainland have demonstrated that the yellow-berried Toyon occurs in numerous areas, but always in association with the red-berried Toyon and with numerous intergrades between the two, the fruits of these ranging through all shades of orange. Examples of yellow-berried forms are: summit of Atascadero to Morro Bay Road, San Luis Obispo Co., Herb. 4409, Nov. 17, 1932 (RSA, DS, CA, P, UC), seeds from this plant were propagated under Prop. No. 1636; Santa Ana Mts., on ridge south of Sierra Pk., *C. B. Wolf* & *B. D. Stark,* Herb. No. 4430A, Dec. 19, 1932 (RSA, DS, CA, P, UC), seeds from this plant were grown under Prop. No. 1680; Santa Susanna Pass in Ventura and Los Angeles Counties (no collections made).

On Santa Catalina Island the large fruited form is most abundant in a red-berried form, but some plants are also found with yellow berries, as well

as a few with fruits of various shades of orange. Of the yellow-berried forms I cite a collection from Avalon Cañon: *Knopf & Johnson,* Herb. No. 1458, Jan. 30, 1930 (RSA, DS). Seeds of this collection were grown under Prop. No. 695. Red, orange and yellow-berried forms were observed by me near Avalon in October of 1932. The yellow and orange-berried Catalina plants have fruits as large as the red-berried ones, and since Munz failed to mention fruit color in his description of the var. *macrocarpa,* I assume that all three color variations are included under that name.

The yellow and orange-berried Toyons on the mainland and on Santa Catalina Island appear to me to be merely variations from the red-berried forms analagous with albino forms in numerous species. Taxonomically, I would recognize but two entities: 1. *Photinia arbutifolia* (Ait.) Lindl., which would include all of the mainland forms with their smaller fruits colored red, orange or yellow; 2. *Photinia arbutifolia macrocarpa* Munz, which would include the large berried forms of the Santa Barbara Islands, but also having a color variation, of red, orange and yellow. Any other procedure than the above would seem to necessitate the recognition of at least four taxonomic units: two on the mainland and two on the islands.

Spartium junceum Linn. Sp. Pl. 708. 1753.

This Scotch Broom is widely cultivated in California and has escaped and become naturalized in a number of places, but as far as I know it has not been reported as naturalized in the Sierra Nevada foothills. It grows abundantly in a ravine 1 mile south of Mokelumne Hill, Calaveras County: Herb. No. 5203, Aug. 9, 1933 (RSA, DS, CA, P, UC, AA). At this locality the species formed a solid colony over 100 by 150 ft. with bushes of all sizes up to 9 ft. high and spread.

Acacia farnesiana (Linn.) Willd. Sp. Pl. 4:1083. 1806.

This Acacia is known in California from a colony of about 15 trees in a small ravine 1 mi. south-west of Otay, San Diego County. The trees or large shrubs are about 12 ft. high, 15 ft. spread and have numerous trunks ranging up to 4 in. in diameter. COLLECTIONS: Herb. No. 2094, May 26, 1931 (RSA, DS, CA, P, UC); Herb. No. 5411, Aug. 31, 1933 (RSA, DS, CA, P, UC, M, UCLA, AA, US, Gr, NY); *F. F. Gander*, Jan. 2, 1934 (RSA, SD).

Material from the above locality was submitted to Dr. I. M. Johnston of the Arnold Arboretum, who reported that the species was not only extremely variable but has also been widely spread by the Mexicans who have grown it as an ornamental. He also reported that there were a number of specimens from San Diego County in the Arnold Arboretum Herbarium, most of which probably came from the Otay locality.

The presence of this species in the vicinity of San Diego is not a recent event as evidenced by the fact that Daniel Cleveland included it in his printed list of San Diego plants (Cat. Pl. in the vicinity of San Diego, Calif. Jan. 1, 1879. page 4, no. 38.) This little known list was brought to my attention by

Mr. F. F. Gander of the San Diego Museum of Natural History. A copy of this list is in the San Diego Museum Library.

Prosopis velutina Woot. Bull. Torr. Bot. Club. 25:456. 1898.

This species was reported from Grantville, San Diego County by Abrams (Bull. N. Y. Bot. Gard. 6:386. 1910). It is of interest to note that this lone tree reported by him has survived and can be seen above the Grantville School on the low benchland bordering the San Diego River. Cultivation of the surrounding land has seemingly prevented the spread of the species by seed. The tree now has a height of over 12 ft., a spread of 30 ft. and a trunk of 20 in. in diameter. COLLECTION: Herb. No. 5410, Aug. 31, 1933 (RSA, DS, CA, P, UC, AA, M, UCLA, US, Gr, NY).

Prosopis sp.

A single vegetative plant of what was apparently *Prosopis juliflora glandulosa* (Torr.) Ckll. was found along Mariposa Creek, near the Mariposa Cemetery, Mariposa County: Herb. No. 4839, May 20, 1933 (RSA, DS). The plant was small but its location was favorable for its survival and for subsequent easy dispersal of seeds to the areas below, so it is possible that the species may become well established in the region.

Oxalis cernua Thunb. Diss. Oxalis 14. 1781.

This African species has been reported as naturalized in California at Colma, San Francisco County. (Leafl. West. Bot. 1:8. 1932; Torreya 32:3. 1932), at Highlands, San Bernardino County. (Leafl. West. Bot. 1:49. 1933) and at Santa Catalina Island (l.c. 1:70. 1933).

This species is so well established in Southern California that it is hardly possible to cite all the places where it may be found. It seems to thrive particularly in the walnut groves where it rivals the yellow mustard (*Brassica campestris*) for display of yellow color in midwinter. Some of the localities where the species occurs are: Claremont, Pomona, Highlands, Fullerton, Anaheim, Rancho Santa Ana, Tustin, San Juan Capistrano, Las Flores and Oceanside. COLLECTIONS: Rancho Santa Ana, *E. R. Johnson* in 1932 (RSA); San Juan Capistrano, Orange Co., Herb. No. 6261 (RSA, DS, CA, P, UC, M, UCLA, US, Gr); Las Flores, San Diego County, Herb. No. 6274 (RSA, DS, CA, P, UC, M, UCLA, US, Gr, NY).

Ptelea baldwini crenulata (Greene) Jepson, Fl. West. Middle Calif. 249. 1901.

Collection of this species from the southern Sierra Nevada foothills, west of Burrough Valley, Fresno County, 1800 ft., Herb. No. 4775, May 18, 1933 (RSA, DS, CA) where it was common, extends the southern limit given in Jepson's Manual as Calaveras County, a distance of approximately 75 miles.

Sphaeralcea bakeri Jepson, Man. Fl. Pl. Calif. 635. 1925.

This species was described as growing in the Fall River Valley of Shasta County. It also grows along the road between Mt. Shasta City and Wagon Camp, Mt. Shasta, Siskiyou County, at an elevation of about 4500 ft.: Herb. No. 6029, July 6, 1934 (RSA, DS, CA, P, US). It is possible that the above locality represents a chance introduction, for the species was exceedingly rare.

Opuntia basilaris Englelm. & Bigel. Proc. Amer. Acad. II. 5: 328. 1855.

The flowers of this species are well known for their large size, their delicate rose color and their large number per lobe (as many as fifteen flowers have been counted on a single lobe). The distinctive odor of the flowers of some strains of this species seems to have been generally overlooked. One collection at the Garden (seed grown plants from plants brought from the Devil's Garden, Riverside County) always has flowers with a pleasant, delicate odor almost identical with that of freshly cut watermelon. Visitors at the Garden during the last three years who have been asked to smell the flowers of this cactus have all agreed that the odor was very like that of watermelon.

Gaura coccinea Nutt., in Frasers Cat. 1813; & Gen. Amer. 1:249. 1818.

This species had previously been collected in California on the eastern Mojave Desert in the Providence and New York Mts. It is now well established in the heavy adobe soil of the low rolling hills 1½ miles east of Brea, Orange County: Herb. No. 3809, July 2, 1932 (RSA, DS, CA, P, UC, M, UCLA, US, Gr, NY). This locality was visited in 1933 and 1934 and the species was still abundant and was apparently likely to become a permanent member of the flora of Orange County. The above determination was verified by Dr. P. A. Munz.

Arbutus menziesi Pursh, Fl. Amer. Sept. 1:282. 1814.

This tree was mentioned by Mr. Terry E. Stephenson (Shadows of Old Saddleback 16. 1931) as native in the Santa Ana Mts. The species grows in a few localities on the west slope of the Santa Ana Mts. at about 3000 ft. on the main fork of Trabuco Cañon, and also in one of the smaller forks to the north: Herb. No. 5534, Nov. 8, 1933 (RSA, DS, CA, P, UC, AA, M, UCLA, US, Gr, NY).

Fraxinus velutina coriacea (Wats.) Jepson.

This ash occurs in Cajon Pass, Lytle Creek and perhaps a few other localities in Southern California. A single tree was found along the Santa Ana River northwest of Corona by I. M. Johnston and reported by him (Bull. South. Calif. Acad. Sci. 17:66. 1918). The species is also found in Orange County, along the Santa Ana River, Santa Ana Cañon, where there are several stands of young trees: *E. R. Johnson,* Herb. No. 5170, July 6, 1933 (RSA, DS).

Trichostema lanatum Benth. Lab. Gen. & Sp. 659. 1885.

Variation in the color of the wool covering the inflorescence of this species, known as Woolly Blue Curls or Romero, has long been known to range from light blue to rich purple. Those forms with the deep purple wool have been most highly prized for horticultural usage. An albino form has been found in which the flowers are pure white, including the wool, except for a faint tinge of very pale lavender on a few filaments. Two such plants were noted in a field of several hundred bearing the deep purple wool in Bouquet Cañon, 3½ mi. above the Los Angeles Aqueduct, Los Angeles County: Herb. No. 3700, May 29, 1932 (RSA, DS, CA, P, UC, AA). Establishment of this white strain in cultivation should prove of value as a welcome contrast to the purple form.

Verbena bonariensis Linn. Sp. Pl. 20. 1753.

This South American species has been reported in California from Marin, Solano and Merced Counties by Miss Eastwood (Leafl. West Bot. 1:21. 1932). The species is also exceptionally abundant in Yuba County, where it was collected at two localities: roadside swale, 8 mi. from Marysville, on the road to Browns Valley, *C. B. Wolf* 1437, Nov. 5, 1927 (RSA, DS); 6 mi. no. of Marysville on the road to Seven Mile House, *C. B. Wolf* & *B. D. Stark*, Herb. No. 5503, Sept. 25, 1933 (RSA, DS, CA, P, UC, M).

Lycium halimifolium Mill. Gard. Dict. ed. 8. 1768.

This species was reported in Hitchcock's Monograph of the Genus Lycium (Ann. Mo. Bot. Gard. 19:208. 1932) as having become established in but a single Californian locality: Beckwith, Sierra County. The species has also become established at the south side of Jackson, Amador County: Herb. No. 5205, Aug. 9, 1933 (RSA, DS, CA, P, UC, M), where twelve to fifteen plants were noted in a colony. The above determination was made by Dr. C. L. Hitchcock.

Solanum triflorum Nutt. Gen. Pl. 1:128. 1818.

This species has been found in three rather widely separated localities in California as follows: between Lake City and Davis Creek, Warner Mts., Modoc County, 5500 ft., Herb. No. 2399, Sept. 5, 1931 (RSA, DS, CA, P, UC, M, UCLA); Swager Creek, 9 mi. northwest of Bridgeport, Mono County, 6800 ft., Herb. No. 5321, Aug. 16, 1933 (RSA, DS, CA, P, UC, M, UCLA); in a citrus grove 2½ mi. north, northeast of Claremont, Los Angeles County, *Louis C. Wheeler* 1124, Aug. 6, 1932 (RSA). In the Warner Mts. the species is perhaps indigenous, but the other two localities seem to be evident introductions.

Sambucus coerulea Raf. Alsog. Amer. 48. 1838.

Sambucus glauca Nutt., in Torr. & Gray, Fl. No. Amer. 2:13. 1841.

Careful search through botanical literature has failed to disclose a single instance where the fruits of this species have been recorded as other than

blue or black beneath the whitish bloom.

Field observations during the last four years have disclosed the fact that nearly fifty per cent of the plants of this species in Southern California bear white (colorless) pulp beneath the abundant white bloom. With a little practice in observation one may even distinguish the two forms from a considerable distance.

The distribution of this white fruited elderberry is apparently limited to Southern California, where it seems to have been known to a considerable number of the lay population, especially the Mexicans and Indians who prefer the white fruited form form for culinary usage. COLLECTIONS: San Diego County:—Proctor Valley, 4 mi. above the Upper Otay Reservoir, Herb. No. 2105, May 26, 1931 (RSA, DS, CA, P, UC, AA); 2 mi. east of summit of grade on road from Proctor Valley to Jamul, Herb. No. 2111, May 27, 1931 (RSA, DS, CA, P, UC, AA, M); one half mile east of Viejas Creek Bridge, Viejas Valley, Herb. No. 2291, July 8, 1931 (RSA, DS, CA, P, UC, AA, M, UCLA, US, Gr, NY). Orange County:—ravine at Olinda, lower end of Carbon Cañon, Herb. No. 2292, July 24, 1931 (RSA, DS, CA, P, UC, AA, M); Rancho Santa Ana, Santa Ana Cañon, Herb. No. 2293, July 25, 1931 (RSA, DS, CA, P, UC, AA, M, UCLA, US, Gr, NY); Silverado Cañon, Santa Ana Mts., Herb. No. 6140, Sept. 21, 1934 (RSA, DS, CA, P, UC). Los Angeles County:—one half mile east of Pacoima P. O., San Fernando Valley, Herb. No. 3832, July 6, 1932 (RSA, DS, CA, P, UC, AA, M, UCLA, US, Gr, NY). San Bernardino County:—Little San Gorgonio Creek, 1 6/10 mi. below Oak Glen, San Bernardino Mts., Herb. No. 4286, Oct. 10, 1932 (RSA, DS, CA, P, UC, AA, M).

It is of interest to note that the white fruited elderberries are much more palatable than the blue fruited in that they lack most of the bitterness so characteristic of the latter.

Aplopappus arborescens (Gray) Hall, Univ. Calif. Publ. Bot. 7:273. 1919.

In Dr. Hall's Monograph of the Genus Haplopappus (Carn. Inst. Wash. Publ. 389:283. 1928) he stated that this species was much less common in the Sierra Nevada foothills than in the Coast Ranges. He gave the Sierran distribution as extending from Placerville, El Dorado County to near Oakgrove, Tulare County.

Either much of the Sierran distribution was unknown to Dr. Hall, or the species has had a remarkable increase since that time.

During the last four years I have collected repeatedly in the Sierra Nevada foothills and in the Coast Ranges, and I have concluded that the species is actually much more abundant in the Sierra Nevada foothills than in the Coast Ranges.

Collections by the Garden Staff range from Tulare County, *J. T. Howell,* Herb. No. 726, Aug. 30, 1927 (RSA) to 5 mi. below Grass Valley, Nevada County, Herb. No. 1735, Oct. 11, 1930 (RSA, DS, UC, UCLA, CI) and Texas Hill, 2 mi. from Dobbins, Yuba County, *C. B. Wolf* & *E. R. Johnson,* Herb.

No. 6153, Oct. 4, 1934 (RSA, DS, CA, P, UC, AA). These latter collections, cited above, mark a considerable northward extension of the range for this species as given by Dr. Hall. At many intermediate points between the above cited localities the species has been noted as abundant, often occuring in large stands.

Aplopappus eastwoodae Hall, Carn. Inst. Wash. Publ. 389: 259. 1928.

Chrysoma fasciculata Eastw. Bull. Torr. Bot. Club. 32:215. 1905.

Dr. Hall gave the range of this species as "restricted to the sand dunes in the vicinity of Monterey and Carmel Bays", and cited specimens from Monterey, Del Monte and Seaside.

What seems to be this same species is an abundant part of the flora in the sand hills east of Bonnie Doon in the Santa Cruz Mts. There it is found in association with *Pinus ponderosa* and *attenuata, Cupressus sp., Adenostoma fasciculatum* and *Quercus wislizeni.*

The Bonnie Doon collection agrees with the Monterey material in having pubescent achenes and long primary leaves, but the heads are somewhat more congested, suggesting *Aplopappus ericoides* (Less.) Hook. & Arn. COLLECTION: Herb. No. 6237, Nov. 9, 1934, from about 7/10 mi. east of Bonnie Doon School, Santa Cruz Mts., Santa Cruz County (RSA, DS, CA, P, UC, M, UCLA, US, Gr, NY).

It is possible that the above collection is from the same area as that cited by Hall (l.c. page 265) under *Aplopappus ericoides* from the mountains north of Santa Cruz which was collected on the State Survey by Brewer or his associates. I have not seen the above material.

Aplopappus palmeri pachylepis Hall, Carn. Inst. Wash. Publ. 389:267. 1928.

The northern limits for this plant were given by Dr. Hall as Santa Monica and Bouquet Cañon, both in Los Angeles County.

There is an abundance of what seems to be this same plant in the sandy bed of the Santa Maria River, along the Coast Highway north of Santa Maria, Santa Barbara County. COLLECTION: *C. B. Wolf & B. D. Stark,* Herb. No. 5522, Sept. 30, 1933 (RSA, DS, CA, P, UC, AA).

Our material agrees with subspecies *pachylepis* in its obtuse involucral bracts, pubescent achenes and foliage characters. However, in growth habit and sandy habitat it suggests *Aplopappus pinifolius* Gray, which has acute bracts, and only slightly pubescent achenes. This latter species also has about the same northern limits of distribution as *A. palmeri pachylepis.*

Aplopappus squarrosus stenolepis Hall, Carn. Inst. Wash. Publ. 389:253. 1928.

This subspecies, characterized by very narrow involucres, narrow acute to acuminate bracts and few-flowered heads, was described from plants grow-

ing on serpentine on the Parkfield Grade in the Inner South Coast Ranges of Fresno (Type Locality) and Monterey Counties. Plants of this area are for the most part only about one foot in height and one to two feet in spread: *C. B. Wolf* & *B. D. Stark,* Herb. No. 5520, Sept. 29, 1933, Fresno County (RSA, and a large set of topotypes to be distributed).

What seems to be this same subspecies was found to the south in the Temblor Range, 11½ mi. west of McKittrick, Kern County, on the road to Santa Margarita, growing in shale and associated with *Quercus douglasi* and *Juniperus californica.* COLLECTION: Herb. No. 6244, Nov. 14, 1934 (RSA, DS, CA, P, UC, AA, M, UCLA, US, Gr, NY, Blake).

The involucres of this Temblor material are somewhat broader than those of the Parkfield collection, but have the same long acuminate bracts and few-flowered heads. The collection was made from a plant three feet high and six feet spread, which is much larger than any plants observed at the Parkfield area, but this may be largely ecological since the plant grew in shale instead of serpentine.

Aplopappus spinulosus gooddingi (Nels.) Hall, Carn. Inst. Wash. Publ. 389:75. 1928.

Californian distribution of this plant was reported by Dr. Hall from "18 km. west of Needles" and from "near the Needles". The plant has also been found in the Whipple Mts. to the south. COLLECTIONS: 3 mi. west of the Copper Basin, Herb. No. 3170, April 30, 1932 (RSA, DS, CA, P, UC, AA, M); American Eagle Prospect, 14 mi. north of Vidal, Herb. No. 3185, April 30, 1932 (RSA, DS, CA, P, UC, AA,); 42 miles from Needles on the Parker Road, *R. S. Ferris* 7213, April 23, 1928 (DS). This latter collection must have been made very close to our Herb. No. 3185.

Baccharis brachyphylla Gray, Pl. Wright. 2:83. 1852.

Hall noted that this species had been reported from San Bernardino County, but that the locality was probably an error, since recent collectors had not found it north of San Diego County (Univ. Publ. Bot. 3:98. 1907). Recent publications treating this species have made no mention of its distribution reaching San Bernardino County.

The species has been found in Morongo Wash, Riverside County, just 3/10 of a mile below the San Bernardino County line: Herb. No. 4275, Oct. 11, 1932 (RSA, DS, CA, P, UC, AA, M, UCLA, US, Gr, NY). The plants at this locality were fairly abundant and it is likely that they could also be found over the line in San Bernardino County.

Cirsium neo-mexicanum Gray, Pl. Wright. 2:101. 1852.

This thistle was found in abundance on the eastern Mojave Desert near the south base of Hackberry Mt., San Bernardino County, 3600 ft.: Herb. No. 3259, May 2, 1932 (RSA, DS, CA, P, Blake). *R. S. Ferris* 4275, April 24, 1928 (DS, P), distributed as *C. californicum,* from the eastern base of Hack-

berry Mt., San Bernardino County is the same and from about the same locality. Our No. 3259 was determined by Dr. S. F. Blake.

Stephanomeria cichoriacea Gray, Proc. Amer. Acad. Sci. 6: 552. 1865.

The Santa Ynez Mts. and Tejon Pass seem to have been the northernmost points from which this species has been previously reported. It is fairly common along the coast of Monterey County, about two miles south of the mouth of Salmon Creek. The species is there associated with *Umbellularia californica, Artemisia californica* and *Ceanothus thyrsiflorus*. COLLECTION: Herb. No. 6222, Nov. 6, 1934 (RSA, DS, CA, P, UC, M, UCLA, US, Gr, NY).

The Collections of Dr. E. L. Greene on Santa Cruz Island

In July and August of 1886, Dr. E. L. Greene collected on Santa Cruz Island. Subsequently he described a great number of species based on these collections, which along with the rest of his herbarium are now deposited at Notre Dame University.

During 1932 I was fortunate in being able to make spring and fall trips to Santa Cruz Island. While there I had an opportunity to talk with Mr. Fred Caire about Dr. Greene's visit to the island. Mr. Caire related that Dr. Greene had made his headquarters at the Main Ranch and had made many trips in every direction, often remaining away for several days at a time. At the close of his stay he promised Mrs. Caire (Mr. Fred Caire's mother) a set of duplicates of his plants as soon as he had an opportunity to name them, so that she might learn the names of the plants of the island. According to Mr. Caire, the plants were sent as promised and were frequently consulted over a period of many years. Finally insects got into them and they had to be thrown away.

Had it been known that a set of Dr. Greene's plants was on Santa Cruz Island, I have little doubt that several California Herbaria would have made strenuous efforts to obtain it, for the set must have contained numerous isotypes that would have been of untold value to any western herbarium.

Dedication of Garden Foundation to the Board of Trustees September 21, 1934, for the Rancho Santa Ana Botanic Garden of the Native Plants of California:

"THE NATURE, OBJECT AND PURPOSE OF THE INSTITUTION HEREBY FOUNDED AND TO BE MAINTAINED HEREUNDER.

Its Nature: A botanic garden of the native plants of California, herbarium and botanical library, containing living and/or preserved specimens of trees, plants and flowers native to California, and literature relating thereto.

Its Object: The preservation and improvement of the property now transferred and such property as may hereafter be transferred to the Trustees for those who not only wish to enjoy, but to study, assembled in one accessible locality, native California plants; and for the advancement of science and education with reference to plant life indigenous to the State of California.

Its Purposes: (a) An institution founded primarily for scientific research in the field of local botany.

(b) To preserve the native California flora, try to replenish the depleted supply of some of the rarest plants which are rapidly being exterminated, and bring together in a comparatively small area as complete a collection of the rich store of native California plants as can be grown in this southern section of the state, thereby promoting the general welfare of the people of the state by providing the means for encouraging and carrying on the above mentioned activities in said state and by doing such other things as may be necessary and desirable to carry out the objects hereof."